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Key-turning Machine.

The first engraving on this page represents a semi-automatic key-turning machine, which was built to turn the keys and taper shanks used in universal joints of gas fixtures. The machine consists essentially of four spindles, with centers for holding and driving the work the same as in a lathe, these spindles being grouped about a central horizontal shaft, as shown. At the right-hand end of this shaft, as it appears in the engraving, is an index plate in which there are four notches, which fix the position of the spindles. The index pin or bolt is automatically withdrawn and inserted, so that the work spindles, one after the other, are brought into proper position relative to the cutting tools, which are held in the tool-posts in the ordinary manner, and fed automatically by means of levers which are attached to the slide rests underneath, these levers being moved by means of a double rack, which is moved by a cam. Both tools cut simultaneously—one roughing and the other finishing. While this cutting is being done, the operator is removing a finished piece from the uppermost spindle and putting in a new piece to be operated upon. The foot stock spindles are thrust forward by springs, and are withdrawn by means of the lever seen at the left.

The revolution of the spindles is automatically stopped and started at the proper time by means of a belt shifter, which is moved by a cam, and operates to throw the belt from loose pulleys to the working ones, and *vice versa*, the upper spindle pulley, however, never coming into contact with the belt. The slide rests can be set at any angle to give the desired taper. The machine occupies a floor space 36″x54″, weighs 1,475 pounds, and has a capacity to turn in the best manner from 7 to 12 pieces per minute, depending upon the amount of stock to be removed, and the nature of the work to be done. The machine is built by Blake & Johnson, Waterbury, Conn.

Improved Punching Machine — Plate-bending Rolls.

The second engraving on this page is of an improved punching machine, in which the especial point of novelty is in the arrangement of the first driving or fly-wheel shaft, which is placed at the side of the machine, and supported as shown, instead of projecting out at the back its full length, as is the usual arrangement. This results in a considerable saving in floor space, and makes the machine entirely self-contained.

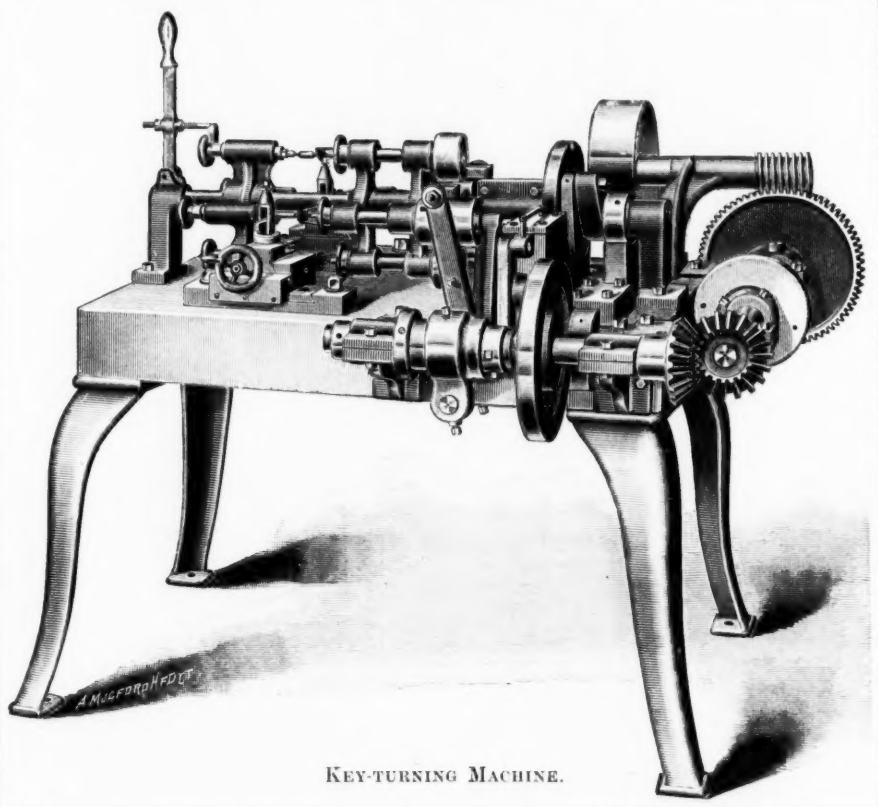
The depth of throat in this machine is 36″, but they are built of any depth desired, or for any class of work.

An adjustable automatic stop is provided which will throw out the clutch and stop the motion of the slide at any desired point. The engraving shows in position a cast-steel die block, there being a filling piece which is removable, so that flanges or channels, I beams, etc., can be worked. It is built by the Hilles & Jones Co., Wilmington, Del.

On page 2 we illustrate a set of bending rolls built by the same company.

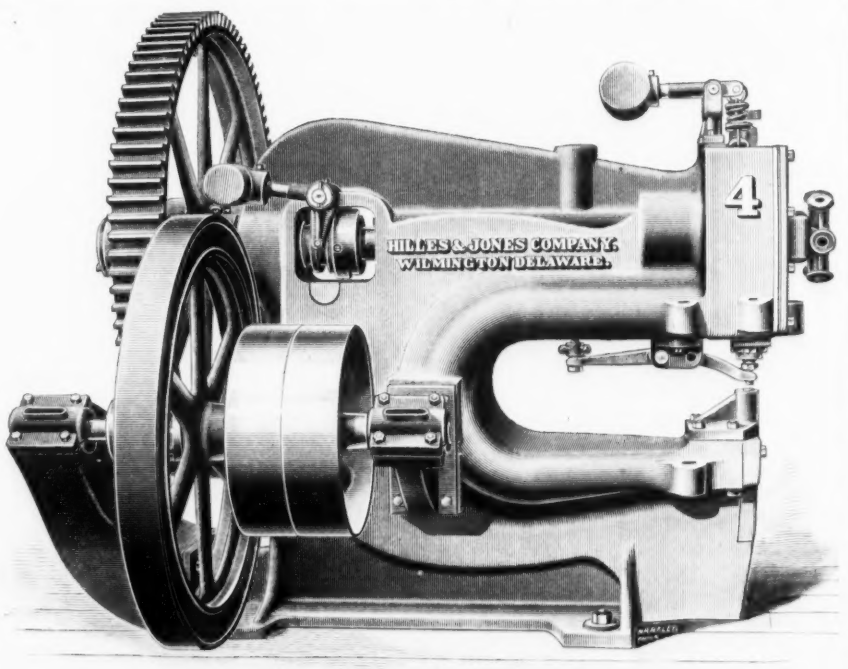
This machine has a top roll 18″ diameter, bottom rolls 15″ diameter, of any length between the housings desired. The tool is driven by duplex reversing engines, which are bolted upon the main bed-plate. The main driving arrangement consists of two pairs of gears with a positive sliding clutch between them driving another train of gearing. This arrangement allows the speed of the rolls to be altered for light or heavy work, and therefore adds considerably to the efficiency of the machine. The clutch is controlled by the left-hand vertical lever shown in cut.

The top roll is raised and lowered by means of worms on heavy vertical screws. The worms are driven through bevel gearing controlled by duplex friction clutches This arrangement allows the top roll to be raised or lowered without changing the direction in which the engines are running. There is a clutch on the worm shaft which allows one end of the top roll to be raised or lowered independently of the other. In this machine the top roll is not shown extended for counterbalancing, although this arrangement can be made except when the top roll is too heavy for counterbalancing.



KEY-TURNING MACHINE.

There are trunnion bearings in both housings, so that tapers can be bent, and the back housing hinges, so that plates bent to a full circle can be readily removed. The heavy bed-plate under the entire machine preserves the alignment of bearings, gears, etc.



PUNCHING MACHINE.

The pinions next the front housing are of cast-steel, and the whole machine is gotten up for the heaviest service. The levers for controlling the different motions are conveniently placed, and experience with the machine shows its efficiency to be very high.

Prudence—Crotchets.

BY JARNO.

To attain the highest success, a concern should employ one or more polite men. This is why we see so many concerns successful; it is because of the politeness of their employes.

A foreman was politely talking with a traveling salesman. A workman came along and asked for a job. The foreman answered, "I will come to you presently: go to your bench and wait." After waiting an hour, the workman again asked what he should do. The reply was, "Oh, get under the bench, or anywhere out of my sight, until I am ready to attend to you," and the foreman continued politely with the salesman.

This workman thinks that a successful concern which employs polite men is a good thing. He also desires me to remind Gascon of the enervating effect of letting machinery stand idle upon the floor, after every one employed in building it has been told to make haste to finish. A foreman is enervated by the question, asked by one after another, "I thought you were in haste for that machine; why do you not have it inspected and delivered?" Somebody says there has been more hurry than haste.

When Waubug determines that it will be a good scheme to dislike some man for a time, nothing that the man does is the right thing to be done, while this scheme is on. The first thing that Waubug will attend to in the morning, which he will also repeat several times during the day, is to watch the man. So much of this kind of attention is paid to him that there is not enough left over to distribute a due share to others, who may make all kinds of mistakes, for the time being, perhaps without being noticed. By and by, however, he is left to himself, and another man is determined upon to be disliked.

Waubug has been to me a convenient source of facts for illustration, especially in extremes. He is usually extreme in opinion and in act, and is always indifferent to applause, as well as insensible to criticism, so that I never have to soften any expression for fear of hitting him too hard. He is fond of making adverse remarks, without even taking time to form an opinion. Thus, the first idea he expresses, when any suggestion is made as to a better way of doing a thing, is, "That will not work."

Now, however, I have been introduced to Secretary, who excels Waubug in at least one particular, which is that of acting in accordance with a carefully-formed plan.

Let us suppose that Secretary has an unsatisfactory man whom he wishes to discharge. The first step is to raise the man's wages. He is allowed to go on in the pleasant thought of the advance for a week or more. He is then approached and notified, with expressions of regret, that, upon further consideration, he is incapable of filling the place he is in, and that he must look for another.

This malignity must react some time. It is the culmination of irony that stabs to kill. Secretary has thus established a reputation for discharging men by first raising their wages. At one time he raised the wages of a man that he really wanted to keep. The man was at once thrown in a state of fear

lest he be discharged, and he begged to be informed wherein he had gone wrong.

Secretary answered, "You are satisfactory, and I want to keep you." It was some little time before the man could be really made to believe that a discharge had not been intended.

Sometimes Secretary discharges in a different, or rather in an indifferent way. One way is to take no notice of the man, and not come near him, so that he may take it upon himself to go, without being told. During years, there has been only one that held out, under this treatment, long enough to be told to go.

There Was a Live Wire About.

A Western Union telegraph call wire left loose on the iron post of the Pittsfield electric street railway became crossed with an electric light wire charged with 1,000 volts and the span wire of the railway company, thus making a circuit through the post to the road-bed.

The first sign of anything wrong was the frantic jumping of G. B. Moore's span of mustangs in passing Pierce's block, and of a span driven by E. P. Quinlan, who reared and ran as far as Maplewood. Mrs. Greenleaf, who drove her horse to Renfrew's store, could not get him to budge from that point, and it took several men half an hour to pull him away from a spot in the road to which his hoofs seemed rooted. This was laid to his having cramps in the legs and stubbornness.

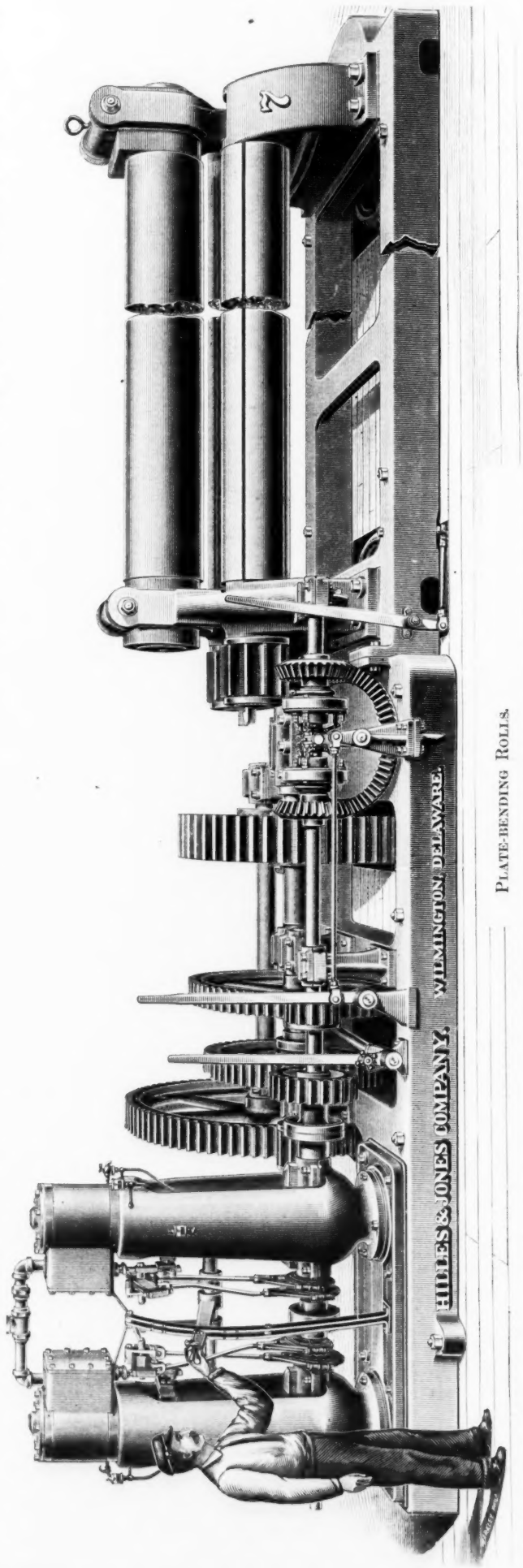
About 8 o'clock Adelbert Huntington, a milkman, drove his horse within six feet of the iron trolley pole, and about three feet from the curb, and went into Pierce's block to deliver milk. In a moment or two his horse was seen to tremble and stagger, and before help could reach him he fell to the earth, straightened out his legs and was dead. That his death was caused by electricity was not even thought of until Mr. Renfrew, in trying to pull the milk wagon shafts clear of the body, received a severe shock from the tire of the wheel, against which a hind shoe of the dead animal rested. The current was then shut off at the electric light plant, and the cause of the trouble was speedily found by the electricians.—*Springfield Daily Republican.*

Cut and Try Methods.

BY W. H. BOOTH.

In a shop with which I was once acquainted, the cut and try method was carried out to a positively grotesque degree. Large flywheels were a common article of manufacture. These were made with ten segments bolted to ten arms. The arms had to be turned and fixed in bored sockets in the hubs, and secured by folding cotters.

In order to find the length of arm for turning off at the bedding collar, the diameter had to be found, and this was done by laying the rim segments upon the shop floor, fixing a long arm trammel at the center, and setting the segments thereby to a true circle. This done with the ends touching, these were scribed off radially for chipping to a fit, and the final radius taken as the radius of the laid-down segments, less a sixth of the collective gaps in the rim. All this lifting, placing and packing of the rim segments was hard work, and required two men with levers, and one man at the crane. Two of the men at this work, very much against the foreman's approval, dispensed with the cumbrous method. They fixed the trammel, and struck a circle on the ground or on a pile of blank flanges raised to correct level on with a bar caliper, took the length of chord of each segment, and set off a series of points round the circle, only they used a half circle only, and took five segments in place of ten as being sufficient for this stage of work. In less than a sixth of the previous time they thus obtained the arm lengths necessary, and saved their employers hundreds of dollars annually. One of them went further than this. Conceiving the idea that tables of sines and tangents ought to be of use, and could not have been put into pocket-books for ornament merely, he measured a set of segments, and calculated the diameter from these chord measurements, and, of course, came out square; but such rank heresy was too much for the authorities, who would not suffer this figuring—it savored too much of witchcraft. But they never got back again to the actual moving of the segments. The introduction of wide rims for rope driving has made it necessary to adopt mechanical methods of planing off the ends of the rim segments, so that the old hand fitting of fly-wheels has pretty well died out. This actual measuring with the castings themselves was quite the rule in other departments, also, of old-fashioned shops, and yet quite accurate results could have been obtained with a long and flexible steel rule, measuring each segment, adding their lengths, and taking out the diameter from a table of circumferences. There are still men who will even figure for themselves areas and circumferences, rather than use a printed table. It is all very well to be able to do this, but a waste of time to do it about on a par with the flywheel method described.



A New Rifle.

Herr von Mannlicher has completed a new weapon whose "fire results" are amazing. Some strictly confidential trials of the new rifle were made in August last by the musketry experts of the Austrian army, but no one else was permitted to test or even examine it. The reports of the Austrian experts are, I am informed, satisfactory in every respect, and I am now in a position to describe in detail the weapon and its capabilities, having been afforded an opportunity to inspect and test it at the branch establishment in Wahring, of the Steyer Small Arms Manufacturing Company.

The length is forty inches. The weight is slightly under that of an ordinary repeating rifle. Its bore is 6.5 millimeters in diameter, the same as that of the latest Mannlicher pattern adopted by the Roumanian and Italian governments. Compared with the former Mannlicher's eight millimeters, this is, indeed, a considerable reduction of bore. But the inventor favors the smaller size, on account of the increased velocity obtained and the reduction in weight of the cartridges. The weapon is sighted up to 2,700 yards, point blank to 500, with the "culminating point" in the latter trajectory at five feet from the ground. The breech action is inclosed, and guided in a cylindrical tube called the breech receiver, of a similar diameter to the barrel in its outside coverings. The trigger mechanism is so constructed that the shots may be fired in the most rapid succession or at any desired intervals. The mechanism, therefore, is simplicity itself. We descended into a big underground vault and fired bullets, or rather poured them, into sandbags. A touch of the trigger of the automatic repeater, and the breech bolt flew back into its closed position. Then followed five piercingly sharp explosions, and the empty clip dropped ringing from the magazine on the floor. The explosions seemed instantaneous. With a stop-watch I timed them and found that they occupied a single second. Barely one and a half seconds to come down from the "present" to the "ready" position, to insert another clip, and then five more shots banged forth in the same limit of time. No cartridge jams. The mechanism is too sound and simple for that. In the hands of its inventor the rifle can discharge about 120 rounds per minute. The barrel becomes hot, but not so hot as to render the rifle useless for a time. Should the exceedingly simple mechanism for automatically operating the breech bolt become deranged the rifle can still be used as an ordinary repeater.

It might be a risky experiment to place in the hands of a soldier a rifle that can easily expend in one minute 100 rounds out of the supply of 150 that he carries in his cartridge pouches. On shipboard, however, when, for instance, sailors on an ironclad have to repel a torpedo boat attack, the rifle is expected to prove extremely serviceable. The men could, with plenty of ammunition lying beside them, pour out bullets like a hailstorm.—*London Times.*

The Mexican Street Car.

The street cars are an institution that will cost you many a real before you master all of their peculiarities. You can hire one for your personal use, and go anywhere for a day for about $3.50, with the privilege of stopping at any one place for not over two hours at a time, and the fun you would have would be like taking a car in Chicago and going all over the north, south, and west sides, pulling the car off the track, and getting the policeman to put it on again if you wanted to visit at any one place for some time. These cars are driven at a gallop, and the driver holds a continuous conversation with his little mules that is always fervid and forcible, and occasionally picturesque. The conductors are very accommodating if there is a small coin in sight, and will sell you a ticket for the lottery, or a ticket for the baths, or hurry off and buy a cigar, and then run the mules to make up for lost time. There was a sign in the cars reading, "Se suplica, a los pasajeros eviten las despididas y saludos prolongadosque retardar la marchas de los carros," requesting the passengers not to detain the car by their everlasting good-bys, but it is a dead letter.

The dear women will hug and kiss and ask about baby and all the relations, and exchange the latest fashions on the street car steps just the same as they try to do in more civilized lands, and the men are just as bad in their way, for they hug, ask questions, swear eternal friendship, and re-light the obstinate cigarettes in a way to drive one mad, especially if you are in a hurry to catch a train.—*Galveston News.*

The Old Engineer Reminiscent.

"It makes me mad," said the old engineer, "to hear people ask why a man don't do so and so when his engine strikes. Lord! It all comes like a stroke of lightning. When we piled 'em up in the Whitesville cut, and killed eight, year before last, I was sitting in my window that night, looking ahead as careful as any one could. We had started on the curve, and she was going as fast as the wheels could turn, forty minutes behind time, and the deuce to pay if we didn't make it up by morning. Jimmy Hartsell was feeding 'er every minute.

"I thought I saw a glimmer of light on the bank ahead. It was the flash from the headlight around the other bend of the curve. Between the time I caught that flash and when I saw the headlight swing around the cut as big as a tub, it couldn't have been a hundredth part of the second. We were nose to nose before I realized—no, I don't think I realized—but I put on the air with one yank, yelled to Jimmy, and fell out of the window. When they threw water in my face I s'posed I was cut all up. The wreck was on fire, and people was hollerin' underneath. I laid there feelin' of myself, expectin' every minute to find a soft, bloody place, but I was all right, and three days after I went to Jimmy's funeral. After that I don't want no man to tell me what you ought to do."—*Chicago News Record.*

Boring Attachment for the Planer.

We give herewith three views made from working drawings, showing the construction of an attachment to the planer for which Mr. T. E. Cherry, of Bath, Me., has been recently granted a patent.

The object of the device is to provide a means for boring, drilling, milling, etc., upon heavy work which has to be mounted upon the platen of a planer, this extra work being done upon it without the necessity for re-chucking.

Fig. 1 is a front view of the machine as fixed up for boring a cylinder by means of a bar provided with a sliding head. Fig. 2 gives a side view of the same, while Fig. 3 gives a sectional view of a table which is mounted upon the platen and driven as shown, the object of this being to do work that is usually done upon the boring and turning-mill.

It will be perceived that the device consists essentially of an extra head which is fitted to the cross-rail of the planer, and is moved upon it by means of a traversing screw in the ordinary way. In this head is mounted a heavy spindle which is arranged to be rotated by means of the worm gearing shown, and can at the same time be automatically fed downwards; a slide and suitable mechanism being provided for that purpose. At the right of this large spindle is a smaller one, which is suitable for drilling, and is therefore given a higher speed and separate feed motion, this spindle being provided with a sleeve in the usual way, and fed by a belt running on small feed pulleys.

When boring horizontally, as shown, the shaft which carries the driving worm is substituted for the vertical boring bar. Motion is imparted to the vertical shaft *n*, which, through the medium of the gears at the left of the cross-rail, gives motion to the horizontal shaft *f* which is splined to drive the worm which is placed upon it. At the foot of the shaft *n* is the mechanism by which the horizontal shaft carrying the bevel pinion which drives the rotating platen is given motion; this, when in use, being reversed, so that the taper end of the shaft enters the taper socket shown at the extreme left in Fig. 1.

It will be evident to our readers that this device will enable many jobs of work to be finished upon the planer without removing them, and so that all parts of the work will be accurately in line, while by extending the rail at the left, to allow the extra head to be run out of the way, the mechanism for accomplishing this extra work in no way interferes with the ordinary use of the planer. The method of working, and the uses to which the device can be put, will be apparent to any machinist.

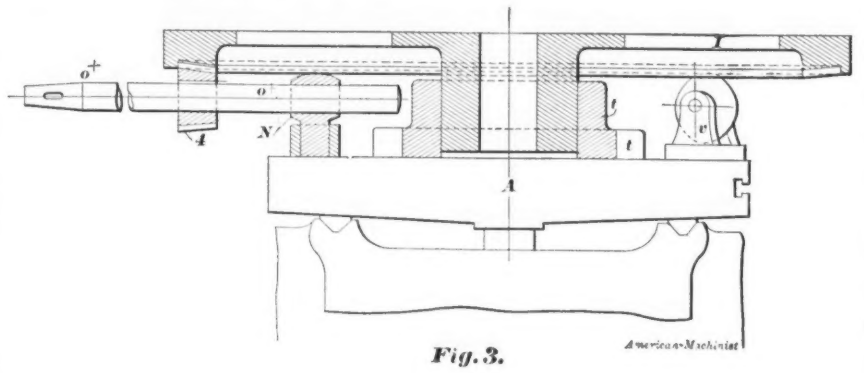


Fig. 3.

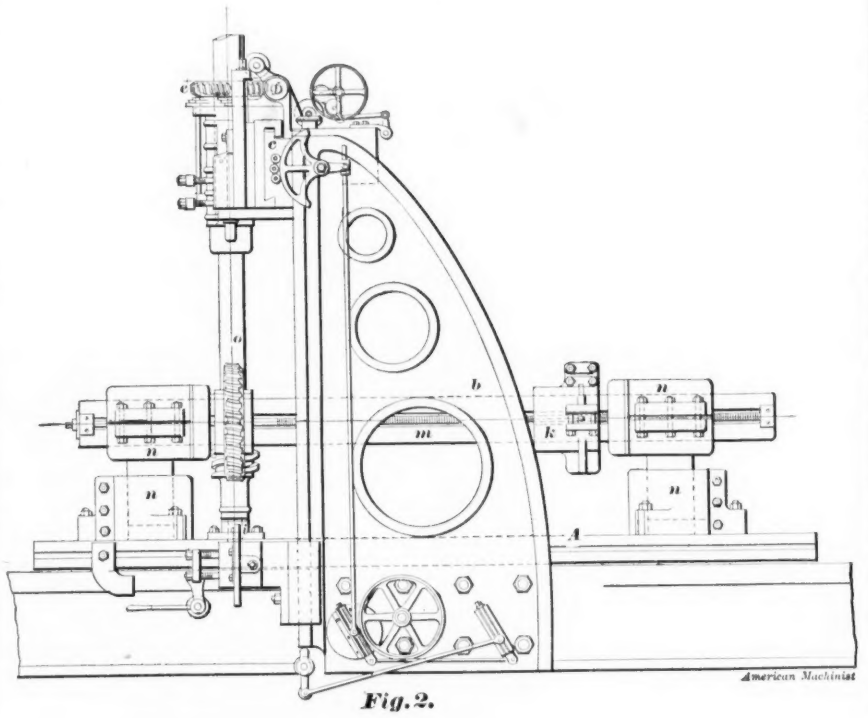


Fig. 2.

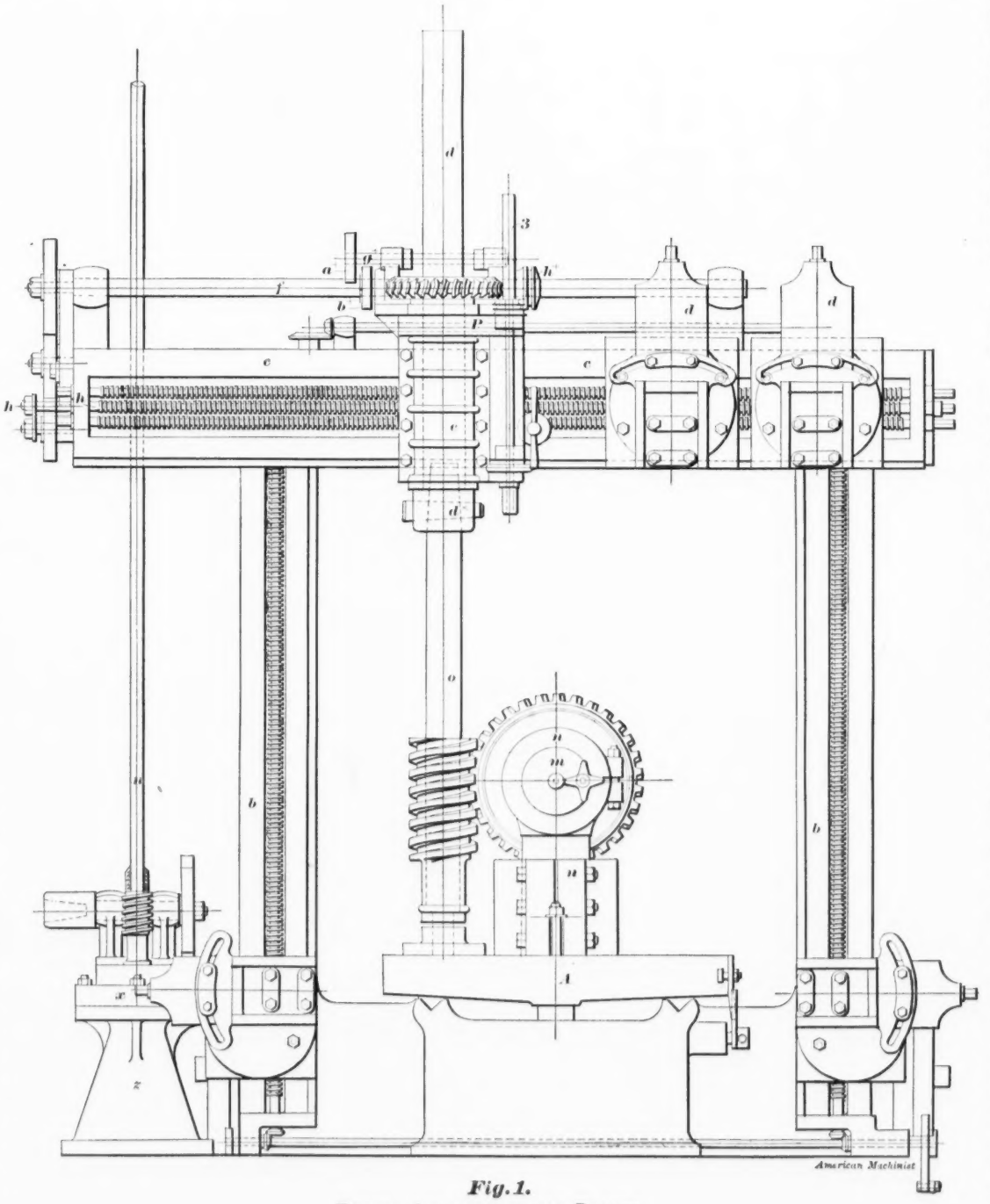


Fig. 1.

BORING ATTACHMENT FOR PLANER.

Commodore Melville's Report.

The annual report of Commodore Melville, Engineer-in-Chief U. S. Navy, has been recently issued, and contains much that is interesting, especially to those who would know something of the causes which lead to the existing friction in the navy, and to the resignation of so many of those who graduate from the engineering department at Annapolis. A year ago Engineer Melville reported that the corps had less officers than were absolutely needed for the safety of the machinery intrusted to its care, yet now it has nine less members still. It has been claimed that there is not room on board the vessels for an increase in the engineer force, in reply to which the report says that quarters "should be provided for the people who are indispensable in the maintenance of the ship, and that it would be better to make reductions elsewhere than to allow a million dollars worth of machinery and the work of 100 or 150 men to go uncared for, even though the cry be raised that the ship has too many engineers when a sufficient number is detailed for necessary duty."

To show the necessity for increased numbers a description of the duties of an engineer at sea is given, from which we quote as follows: The assistant engineers, of whom there are usually three on board a ship of from 5,000 to 10,000 H. P., "are obliged to stand watch in three watches at sea and often in port, a duty so exhausting that no officer can long perform it efficiently, for he never has a whole night's rest, and when on duty has to withstand a constant, merciless assault upon his physical and mental powers. His post on duty is one of intense heat and villainous atmosphere; to get from one part of his station to another, which he must do very frequently, he must climb up and down narrow ladders, crawl through air locks, explore coal bunkers, etc., all the time in a state of mental anxiety on account of the innumerable casualties, great and small, that are constantly occurring, and for the prompt remedying of which he is strictly accountable; in one water tight compartment some boiler tubes are leaking, and the men are in a panic; in another, a hundred feet or more away, a feed pump is refusing to work or a thrust bearing is hot, and while hurrying from one scene of danger to another the engineer is liable to receive tidings of trouble in some remote coal pocket, or even be summoned to appear on deck, where he must calmly answer questions regarding the amount of smoke escaping from the smoke pipes or the necessity for hoisting ashes, wholly unmindful of the disasters which he knows are impending below. So it goes watch after watch and day after day, until in the course of a week or two the engineer is a nervous wreck, fit for nothing but the hospital, and all because the lack of numbers imposes upon him the work of at least two men."

Speaking of a pending bill which provides for an increase in the engineer corps to 300, the report says:

"The only opposition to this bill thus far has come from some of the officers of the navy, who seem to view with jealous distrust the growing importance of the engineering branch of the service, and see in it an imaginary menace to the supremacy of the positions which they have inherited from naval conditions now obsolete. The plain fact is that the era of the sailing frigate with lofty spars and snowy canvas has forever passed away, and with the passing of the frigate must occur also the disappearance of much of the picturesque *personnel* which served its purpose in its own time, but which is now out of place on the sea except in its romances. Naval gentlemen who resent the intrusion of the steam engine and its attendants are doubtless sincere in their convictions, and really believe that the "Constitution" is the proper type of fighting ship, and that the "New York" is not, but they draw upon the traditions of the past for their propositions, and overlook the living facts of the present. The stage driver did not yield his place to the locomotive driver until a vast amount of prejudice and conservatism had been overcome

by the logic of facts, and our navy will be neither modern nor efficient until it has accepted similar relegations. The sailmaker must make way for the machinist and the boatswain for the blacksmith. The topman on a yardarm, struggling with a weather earring in a gale of wind, is a figure that has been almost deified in the literature of the sea, but the service he rendered to his ship and his country never exceeded in importance the unsung deeds wrought daily in these times by the mechanic with hammer and chisel in the depths of an engine or boiler room."

Referring to the matter of rank, Commodore Melville says that the conferring upon engineer officers the rank of their grades, instead of the honorary relative rank now held by them, would be nothing more than an act of justice in recognition of the services of officers "who have to do the greater part of the work of maintaining the efficiency of our modern war vessels."

The opposition to this, he declares, originates "with some officers who claim that it threatens their right to absolute command."

"Whether or not it is good policy to intrust the full control of sailless ships, every function of which is performed by a machine, to officers who, by education and training, are ignorant of the operation, care, and management of machinery, is a question that is worthy of very serious consideration, but it is one that is not raised by any provision of the bill which these officers oppose. On the contrary, the bill provides that the right of the engineer to exercise command shall be confined to his own department, where he does most unquestionably need that right. The wording of this provision of the bill was taken from laws that have existed for forty-five years regarding the status of staff officers of the United States Army, and therefore should not be regarded as anything unusual or speculative, especially as the possession of rank, without command except in their own departments, has made the staff of the army a contented and efficient body of officers, and has effectually put an end to the petty line and staff differences which still distress the navy. . ."

He takes up the cause of enlisted men in the engineer force, among which are included firemen and machinists. He says the navy does not now get suitable men as machinists, and good ones seldom serve more than one enlistment. Machinists have a hard time of it on shipboard, and there is nothing to attract respectable and ambitious men to take that rating.

"If a machinist or fireman crawls out of the hellhole where he is on duty to get a breath of fresh air, he may be promptly driven below again or even punished for appearing on deck 'out of uniform,' while the discovery of a speck of dirt anywhere on deck subjects any member of the engineer's force who may have the rashness to be above the fire room gratings to abuse from the boatswain's mates, and probable punishment at the mast. That the decks of a man-of-war should be of spotless purity is a tradition handed down from the days of wooden ships and barefooted crews, and is so impossible a condition in these days of coal and iron and steel, that it seems a little intelligent consideration would lead to its abandonment."

". . . There is another thing that is too often overlooked in naval discussions regarding the status of machinists on board ship, or of Americans in the navy in general, and that is the fact that the United States is a free country, founded in the first instance as a refuge for intelligent men from the very conditions of mental and physical servitude which the navy by clinging to old methods imposes upon our citizens who enter it. We hear only too often in the service arguments based upon the condition of enlisted or conscripted men in the monarchical military organizations of foreign countries, as though we could by any possibility benefit by such incongruous comparisons. We can and do get foreigners to serve in our navy, and accept conditions exactly like those which they may have abandoned their own countries to avoid, but we will not have an American navy until it is manned by Americans, and that time will not come until we cease attempting to perpetuate on our ships military customs which flourished in feudal times.

"After giving this matter much careful consideration, I am convinced of the necessity of creating a corps of engine room petty officers, composed of machinists, blacksmiths, boiler makers, and coppersmiths, whose numbers will be determined by the actual need for men of these ratings, and not dependent upon the total number of the enlisted force of the navy. I am prepared to submit at the proper time, for the consideration of the department and the Bureau of Navigation, details as to the numbers needed, and a scheme for the organization and recruiting of such a corps. Without entering into it fully at this time, I will say that my scheme will recommend provision for permanent service by making the period of enlistment much longer than at present; by granting privileges on board ship as to quarters, leave to go on shore, immunity from drills having no connection with their duties in either peace or war, etc., by making possible employment on shore in fitting out new ships in which the men are to serve, and by providing for retirement on a pension after a certain length of continuous faithful service."

Further on, Commodore Melville refers to the matter of weight of engines and machinery on board naval vessels, and states that, while our machinery has been criticised as being too heavy for the power developed, it has stood the test of every requirement, while in some of the foreign navies failures have occurred due entirely to weakness in the designs. An appropriation of $25 000 is asked for, to experiment with petroleum fuel, which it is thought will prove especially advantageous in torpedo boats.

The Wuerpel Switch & Signal Company's Plant, Denverside, East St. Louis, Ill.

BY H. B. SLATE.

This concern was recently organized for the manufacture of railroad switching and signal apparatus under Morris Wuerpel's patents, and is equipped with the best modern machine tools, the shop being arranged to do their work to the best advantage, in accordance with modern shop practice.

One innovation introduced is the method of driving machinery by compressed air, and we believe this is the only large shop running exclusively by this power; there are cases of isolated machines driven in this manner, also of shops using electric motors, but this shop uses compressed air only.

The power plant consists of boiler and necessary auxiliaries, and a Norwalk air compressor, with storage tank to equalize the pressure, and is so arranged that the steam supply is regulated automatically by the amount of power used in the shop.

The air is piped to the machine and pattern shop; these are separate buildings located about one hundred and fifty yards from the power house. The dynamo for the electric light is located in the power house, and driven by a Rice automatic engine, using compressed air instead of steam.

A noticeable feature of the machine and erecting shop is the absence of a line shaft, large pulleys and belting. At first sight it looks strange to any one accustomed to the regulation arrangement for distributing power.

The advantages in this arrangement are, economy in first cost, space and light, saving of power to run line shaft, also freedom to place the various machines in the most favorable position without regard to any line shaft.

The motor used with each machine is a Krebel oscillating engine, placed close to the outside wall, and entirely out of the way, occupying less than two feet square of floor space, or on a wall bracket.

The machine shop is equipped with a 10x14-foot boring mill, 6 foot Universal radial drill, Long & Alstatter punch and shear (engine coupled direct), 21" screw machine, 24"x14-foot lathe, horizontal cylinder-boring machine, 20" traveling head shaper, 30" Gould & Eberhardt drill, 36" planer, Williams & White bulldozer (engine coupled direct) 48", four-head planer, 1,100 pound Morgan "steam" hammer, operated by compressed air instead of steam, 36"x30-foot engine lathe, pipe machine and bolt cutters.

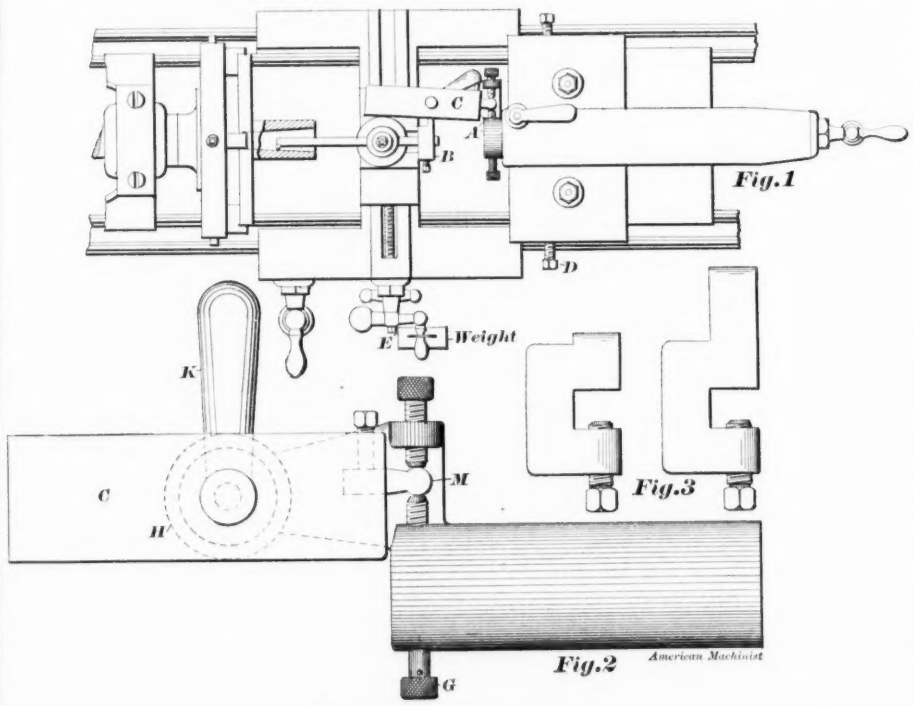
A small shaft is run across one end of the shop, driving a number of small lathes, small drills, emery grinders, drill grinder, milling machine, etc.

The pressure now carried is 80 pounds, which may be increased to 110 pounds, if necessary.

Under this system, when a machine is not in use it is using no power; there is no dripping or leaking from steam pipes, no exhaust pipes are necessary, and in many ways this method commends itself.

At present we are not prepared to give exact figures showing economy in using steam power direct over line shaft, but Mr. Wuerpel states positively there is economy enough to show noticeably on the coal bills.

This concern has the contract for the entire switching and signal system to be used at the World's Fair grounds in Chicago.



TAPER-BORING ATTACHMENT.

Taper-boring Attachment.

The accompanying engravings show the construction and method of operation of a new attachment designed to enable true taper holes to be bored upon the lathe.

The attachment consists essentially of a cylindrical shank or body which is fitted to go in place of the foot-stock spindle, and when put in place is clamped firmly by the usual binding screw. At the outer end of this is an arm upon which is supported the straight edge *C*, which is of steel, hardened and ground on the working edge. It is pivoted at the center, as shown, and can be clamped in any desired position by the clamping handle *K*, the arrangement of the bearing here being such that the contact is only upon the outer portion, as indicated by the dotted lines in Fig. 2. At the right hand end of the piece *C* is a removable piece against which opposing screws bear, and by which the bar *C* can be adjusted, one of these screws being so graduated that it readily indicates the parallel position of the bar *C*, and also indicates the taper to which it may be set by $\frac{1}{64}$" to the foot.

To the back end of the tool used for boring, one of the clamping pieces shown in Fig. 3 is secured as shown in Fig. 1, the end of this resting against the side of the bar *C*, against which it is kept with a steady pressure during the feeding of the tool, this being accomplished either by turning the cross-feed handle by hand, or by attaching a weight to the crank or to a pulley put on in its place. The adjustment to cut is made by the screw *D*, Fig. 1.

The bar *C* may also be turned to an angle which will enable it to be used for facing, "dishing," or for turning any angle, in which case it is generally preferred to let the end of the tool rest against it directly. This device is, of course, applicable to any lathe, and was originally designed for use in the shops of J. T. Slocomb & Co., of Providence, R. I., where it was found to work so well that it was concluded to make them for others, which this firm is now doing, leaving the shank which fits in place of the foot-stock spindle to be fitted by the purchaser.

The Segmental Wire Gun.

Among the objects of interest brought to the attention of the members of the Institute of Mining Engineers during the Schuylkill Valley meeting was the Brown segmental wire gun, now in process of construction at Birdsboro. This is a five-inch high-power breech-loading rifle, 19 feet long, which is being built under the engineering direction of Lieut. G. N. Whistler, of the artillery branch of the United States Army. The system of construction consists essentially in substituting for the solid tube of the modern high-power cannon a number of longitudinal steel segments, and winding around these, strips of metal layers of square steel wire subjected to a constant tension of 130,000 pounds to the square inch, which, so held together and covered with an external jacket of steel, form the tube of the gun. By this process of manufacture the inner core of the gun allows of a higher physical condition and degree of special elasticity than is possible to produce in the larger masses of metal heretofore used in modern cannon.

In order to demonstrate practically the enormous pressure which this form of gun will be able to withstand in firing, a stub representing the powder chamber was made, and encased in a steel jacket, into the ends of which heavy plugs were screwed, entirely closing the chamber, with the exception of a small orifice one-fifth of an inch in diameter, to serve as a gas vent and firing orifice. Upon firing the first charge it was found that the pressure exerted on the interior of the chamber was 50,000 pounds per square inch, while the second discharge registered a pressure equal to 62,700 pounds to each square inch of surface. This enormous force was found to have no effect whatever on the condition of the gun, there being not the slightest indication of displacement of the segments or enlargement of the bore.

In the breech-block of this gun a continuous thread is used, and, when the block is thrown open for charging, a latch locks it, so that it cannot be turned until it enters the breech. This insures proper centering of the threads under all circumstances, and a consequent minimum of wear.

At the breech of the gun the steel segments are covered by over 30 layers of the square

wire, the number increasing as the muzzle is reached. The service charge of a gun of this size, made in the usual way by shrinking steel hoops over a central tube, is limited to a powder pressure of 37,000 pounds per square inch, while in this gun the ordinary charge will generate 50,000 pounds pressure, and 60,000 pounds per square inch can be reached with entire safety.—*Philadelphia Record.*

Large and Small Wheels in Fast Locomotives.

I trust I shall never be so foolish as to enter in the columns of the AMERICAN MACHINIST anything so senseless as appears in some of the discussions anent the respective merits of the locomotives of my own country and of America. As the AMERICAN MACHINIST editorially says, engineering is too world-wide to permit of such folly. When I speak of English locomotives in reference to my advocacy of larger wheels for American express work I do so not because they are English, but because England is the only country where really high speeds are common or where large-wheeled locomotives are plentiful. Nothing is further from my thought than a mere party discussion. When I get into such a partisan state of mind I shall commence with an essay to some learned society, "On the influence of latitude as affecting the area of an 18" locomotive cylinder," or "The variation in tractive force of locomotives due to the picture on the tank," or some equally relevant subject.

Hence I am sorry to see Mr. Kefflo requesting Mr. Crane to hit hard at this side about our locomotives. No manner of good can come from this spirit of discussing a question of mechanics, and if Mr. Kefflo thinks that Mr. Crane has hold of any big end I might point to the practice of that one horse American Railroad, the P. R. R.—the superintendent of motive power of which line seems to have got hold of my end, anyhow. My American journals of October 14th inform me that there has just been completed at Altoona a passenger engine of the two cylinder compound type, with cylinders 19" and 31" x 28", and 84" wheels, 42" truck wheels, and a tender with three pairs of wheels only. Now for what object is this engine built? Why the 84" wheels if not because the designer is of opinion that, for high speeds, wheels must be in proportion? There is no question here of Anglomania or any other mania. Here we have the P. R. R., as well as its rival, the N. Y. C., adopting larger wheels for high speeds, and indeed we may very well ask Mr. Crane whether, if the small wheels he advocates are fit and proper for the high speeds now being run in America, there must not surely have been something amiss with previous American practice? In place of the 60" wheel we ought to have seen an ordinary slow passenger train run with a 40" wheel. Let us inquire further into the matter, to see what advantage a large wheel has over a small one. We will take ordinary English practice. Our 96" wheels have cylinders 28" long. The 84" wheels are fitted with cylinders of 24" stroke. The relation of stroke to wheel diameter is thus almost exactly 1 : 3½ in each case, the larger wheel having of the two the bigger stroke. Assume them, however, equal, and we see that at the same rate of travel the large wheel has the same piston velocity, and so gets rid of an equal weight of steam per minute at the same rate of expansion, but it has something like 12½ per cent. fewer reciprocations, and therefore can run faster for equal reciprocation. As regards the unequal rail pressure due to the vertical action of the balance weights in the wheels, the large wheel exerts a far more even pressure, the relation of the centrifugal forces being as 7 to 9 very nearly, and this is a far more important item than many believe it to be. Bridge engineers recognize the importance of the stresses due to counterbalance perhaps more clearly than any other engineers. When we attempt to compare general practice in America and in England we are met at the very outset with different conditions.

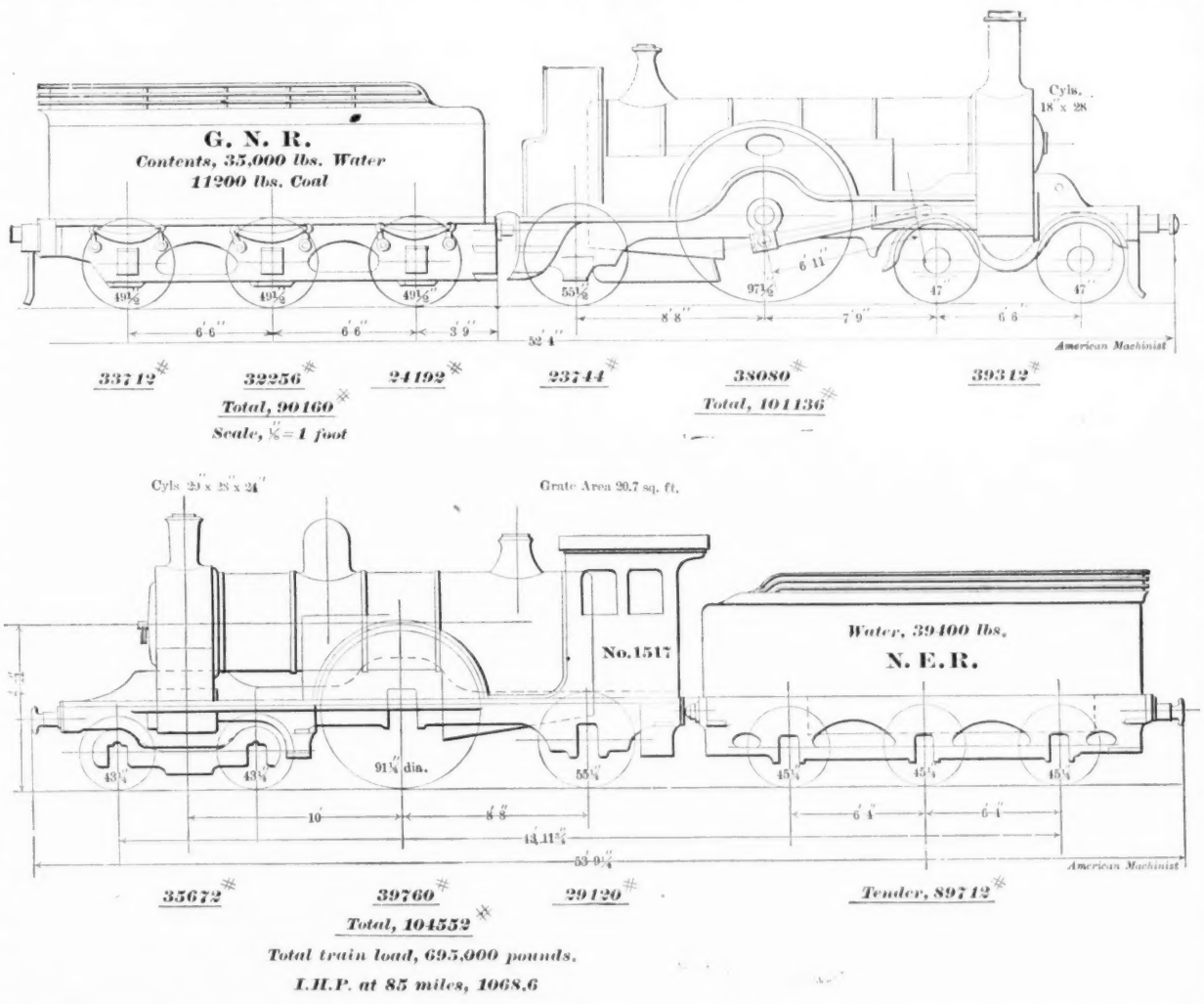
When railroads began here they found a thickly settled country covered with the best of roads. The country made the railroads and made them right off in the very best known manner as to track and ballasting, so that forty years ago trains were scheduled to run 118 miles in two hours. In America the railroads have had to go before settlement, and of necessity in a thinly populated country of long distances; it was clearly impossible to build roads as they were built here, and until very recently fast running could not be safe. Now, however, that a large portion of America is approaching the European standard of population density, the railroads have in such localities taken on the same solidity and substantiality of rails and ballast, and high speeds follow as a consequence. To argue that the adoption of wheels in proportion is a reflection on past practice is unreasonable. One might just as well condemn the use of broken stone ballast because the conditions in England enabled it to be used here earlier than in America. The subject, in fact, is quite too much one of general principles to admit of partisan argument. In every country there will be variations in practice which are interesting to study because they point to the causes which bring them about.

Thus in the Altoona engine there is a stroke of 28" to an 84" wheel—a ratio of 1 : 3 as against 1 : 3½ which prevails here, and the cylinder diameter is 31" as against 30", which is the largest cylinder used here in a compound. The grate surface again is larger. Now all such differences have a reason. They are not points to be proud of or ashamed of, but simply indicate that certain differences exist in the following train, either in frictional resistance or greater load concentration which demand equivalent differences in the engine. I inclose with this, outline diagrams of two of the most successful locomotives on fast traffic on this side, with the wheel loads. The outside cylinder engine has a 97½" wheel, and I often travel behind one of them running many miles in succession at the rate of 72 per hour. The other is a compound with also a single pair of drivers, 91¼" diameter. At a speed of 85 miles per hour with 170 lbs. boiler pressure, this engine indicated 1,068½ horse-power, and at 75 miles with 175 lbs. steam, 1,041½ was shown by the indicator, the total train load being 695,000 pounds, a sufficient load to demonstrate that a single pair of large wheels can do all that has yet been accomplished by coupled engines of equal cylinder power. Now will Mr. Kefflo explain why an American-built engine to the dimensions of Fig. 2 should fail to do as good work, by which I mean, of course, an equal duty at the drawbar? Possibly it would not perform an equal duty in gross train load, but to my mind the cause for such failure would not lie in such trivial differences as the bar frame or the material of the cab; it would be found, if at been too liberally proportioned? It is, however, generally admitted that this point has been a difficult one, and we find valves now receiving a larger travel—an improvement good enough in its way, but one which certainly adds to wear and tear.

The opinion seems to be gaining ground that the resistance of a train does not increase at high speeds to the extent which was once considered it should do as reasoned out from the increase at lower speeds. The power of a locomotive increases with its speed if the back pressure can be eliminated, and this becomes serious in many engines at high speeds. Indeed, Mr. Crane's contention that no trouble is experienced with the exhaust is scarcely borne out by the assiduity with which any new design or arrangement of valve gear is put forward as giving so good an exhaust.

The N. E. engine is the heaviest single driver in this country. If Mr. Crane still doubts what a single engine can do let him compare the performance of this engine, No. 1,517, with any coupled engine, especially as regards the proportion between the engine weight, 104,552 pounds, and the gross load, 695,000 pounds, which the engine hauled at 86 miles per hour. I should be glad if Mr. Crane would let us have some information upon the large-wheeled engines which are now coming into use on American express routes.

W. H. BOOTH.



The New Cape Charles Lighthouse.

The Lighthouse Board is just nearing the completion of the plans of the new power for the Cape Charles Light station. The tower is of the order known as the skeleton iron tower. The light will be 175 feet above the level of the ocean, and will be visible about nineteen miles out at sea. The encroachments of the sea upon the present site have been so great, the present tower has been in danger for some considerable time past, and it is proposed to build the new tower and abandon the old as soon as practicable. The new light will also be distinguished as showing the first of the system of signals devised by Capt. Mahan, the Engineer Secretary of the Lighthouse Board. These signals are simply numbers which indicate the light. In the Cape Charles light the number will be 45, shown by a group of four brilliant flashes, followed by a group of five brilliant flashes, with an interval of about five seconds of darkness between the two groups. The number appears every thirty seconds, and the dark interval between the last flash of the five and the first flash of the four will be fifteen seconds. The flashes will be intensified by making the dark side of the lenses a reflector, so that the whole of the light furnished by the lamp can be utilized.

If this new light at Cape Charles should prove successful in doing what is expected from it, it is very probable the system will be adopted for the lights on the Atlantic coast, especially for all those known as "fixed" lights. It has long been recognized that the age of usefulness of "fixed" lights is past, in view of the great number of bright lights which are now found at many parts of the coast, and with which the "fixed" lights of the lighthouse establishment have sometimes been confounded. It is not likely the Lighthouse Board will be able to complete the new Cape Charles light and have it in operation in less than one year from the present time, as the entire station, including

the lights, keepers' dwellings and outbuildings, all have to be built. The entire force of draftsmen at the disposal of the board has been put to work on the plans, and the work is to be pushed with as great rapidity as possible.—*Baltimore Sun.*

LETTERS FROM PRACTICAL MEN.

Piston Rings—Oiling Devices—Monkey Wrenches—Cupped Emery Wheels.

Editor American Machinist:

In your issue of Nov. 24th Mr. Wilson expresses a desire to see several things, some of which have been long in use, and may easily be seen, others he probably would not like if he were to see them.

Prof. Sweet's "limited expansion" piston is the one he wants to see, and it perfectly fills his requirements, except that it is not "like a solid piston." He wouldn't want it to be, either, if he were paying the running expenses.

The writer does not believe the steam packing idea "off the track," probably because he builds an apparently satisfactory steam-packed piston.

The state of derailment of the piston valve maker who attempts to work to Mr. Wilson's specification will certainly be something serious, and when he gets the thing made, what will prevent its leaking as badly as ever?

A glance into the ad. columns of any English mechanical paper will show upright engines with the oiling devices Mr. Wilson describes, and at least one American builder has used the same arrangement, although the writer is not able to state names with certainty.

Probably Mr. Wilson could, by paying the price, get a monkey wrench with the back made of tempered cast-steel, and probably, again, he would find it requiring at least a foot more gas pipe to break it. The best way to improve the monkey wrench is to keep it locked up for emergencies.

There are several fly-wheel governors in the market in which the resistance of a well-balanced valve is an inappreciable factor, in so far as having any effect on the governing is concerned. The Straight Line governor is a good example for one, to say nothing of the locking governors, which will drive an unbalanced valve.

Regarding the cup emery wheel discussion, the writer has, by shrinking a paper band around them, used small wheels 2′ to 4′ at speeds which would ordinarily be impossible. Cut a long strip of thin, tough paper, rather wider than the face of wheel, saturate it with thin glue, and wind tightly around the wheel, making it $\frac{1}{8}$″ or so thick; when dry it will be shrunken tightly upon the wheel, and will be of great strength. It works finely to at least 4″, and there seems no reason why it would not do equally well on larger sizes.

One use of these cup emery wheels is to grind balls, not complete spheres, but a zone taking in all but the arctic circles; for instance, where a ball is on a stem of say $\frac{1}{2}$ its diameter, as is generally the case when it is to be used as a bearing. After being roughed out the ball is mounted on dead centers, with its axis at right angles to and in the same plane with that of the emery wheel; the axis of the wheel also coincides with the center of the ball, both ball and wheel are revolved, and the wheel being crowded against the ball trues it up elegantly; of course the wheel must be smaller than the ball. One would suppose that the wheel would clog, cutting as it does throughout the revolution, but it is cutting on a surface which has a rapid and constantly changing motion, and this seems to loosen and carry out the particles of metal.

E. J. ARMSTRONG.

Indicator Diagrams.

Editor American Machinist:

I inclose you herewith copy of some indicator cards recently taken from one of our center crank medium speed automatic engines, with the latest improved governor of the writer's invention, and send it to you to show how nearly we can approach to the theoretical indicator card in actual practice in the single slide-valve engines, thinking possibly you might be interested to know how close theory and practice can be brought together.

WM. O. WEBBER, Gen'l Supt.

[The diagrams show excellent steam distribution, and will speak for themselves. They are models in their way from this or any other type of engine.—ED.]

That Bursted Emery Wheel.

Editor American Machinist:

Mr. Walker is wrong in his effort to make the question a personal one, for it is not personal—not a question between myself and the makers of that wheel—and, if it were, it would not appear here.

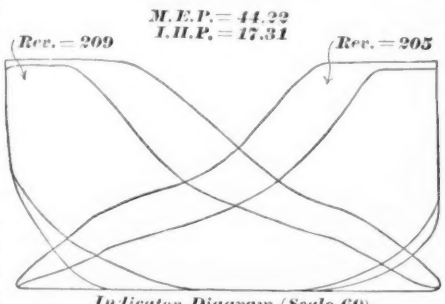
It is purely a theoretical and moral question. Is the cupped emery wheel a safe form? What is the duty of the maker of a dangerous article? The facts in the present case simply serve to start the matter, and to show that it has a practical application. The testimony that one such wheel has burst offsets the evidence that many such wheels have not burst. That such a wheel, properly handled, is safe, is admitted; but the query is simply this, "Are such wheels dangerous in use?" A keg of gunpowder is safe if fire is kept from it, but I don't believe Mr. Walker would store one in his cellar.

I bought a bottle of cyanide potassium, and the manufacturers had put on it a label with a death's head and cross-bones, and the word "poison." It looks something like candy or salt, and some ignorant or careless person might eat it if not so labeled. The manufacturers were doing no more than their plain duty when they attached that label, and could not excuse themselves in case the absence of it resulted in death, on the ground that they knew of many unlabeled bottles that never did harm.

I bought this twist drill grinder of a first-class firm of machinery dealers, and it was set up by a competent foreman. It had on it a ten-inch emery wheel, and the foreman set it to run at the standard speed for that size of wheel. The whole business was managed carefully and by competent men, but, nevertheless, it one day went off with a bang and nearly bored a hole through a man. Searching for a reason, it was found that the makers had issued a circular stating that the wheel must be run at a very low speed, much below the standard for a ten inch wheel; but that circular never reached me, and, as neither myself nor my foreman is an expert on emery wheels, we speeded the thing too high.

I do not feel that I am requiring too much when I claim that makers of dangerous goods, cyanide potassium, lop-sided emery wheels, wood alcohol, dynamite, and anything that men of ordinary intelligence can easily mistake for somethi g perfectly harmless, are in duty bound to use all possible precautions to prevent accident.

There was plenty of room on the frame of that twist drill grinder for the caution to speed the wheel very low, and, because no such warning was given, the maker must share the blame with me. I was ignorant, he was careless.



Indicator Diagram (Scale 60)
Erie City Iron Works.

I will also risk the statement that there are a great many of those dangerous cupped emery wheels now running at full speed, and waiting only for a good chance to go to pieces.

GEORGE B. GRANT.

Lexington, Mass.

An Adjustable Solid Piston—A New Spindle Bearing for Lathes—Some Wonderful Inventions.

Editor American Machinist:

In your issue of November 24 Mr. Wilson inquires for a solid piston that can be kept a good fit in a cylinder. I know of an engineer in the State of Maine who favors the same arrangement. He uses the old-fashioned packing, such as is shown in Fig 1, consisting of three rings and springs, as shown, but instead of having the follower screw up against the head itself (as we have been taught that all good piston followers should), he has it fitted to clamp the rings fast. When the piston requires adjusting he slacks up on the follower, when the rings will usually expand themselves to fit the cylinder, but if not, he removes the fol lower and sets them out, after which he screws the follower up tight, and runs it as a solid piston. He claims that the cylinder keeps true longer than when the common pistons are used, and that it works just as well in every other way.

There are quite a number of different kinds of journal boxes in use, but I believe there is yet a chance for improvement in the front box for a lathe or milling machine. I suggest the arrangement shown in Fig. 3. *A A A* are taper gibs which form the box. *B B B* are oil grooves filled with wicking. *C* is a circular plate adapted to receive three headless screws, one of which is shown at *D*. These screws are for the purpose of pushing the gibs for adjustment. As the gibs can be adjusted independently, the spindle can be lined with the ways of lathe quite conveniently after wear. *E* is a hardened steel washer, and *F* is to represent the large gear on spindle. When the gibs are to be set up, the back thrust screw (not shown) should first be loosened, so as to allow the whole spindle to go back with the gibs. It seems to me that this box can be made as cheap as any other good one. I should favor, for a lathe, cast iron gibs with holes babbitted, and a steel spindle, hardened, ground and lapped.

Fig. 1.

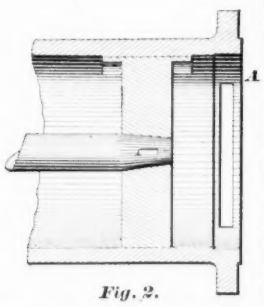


Fig. 2.

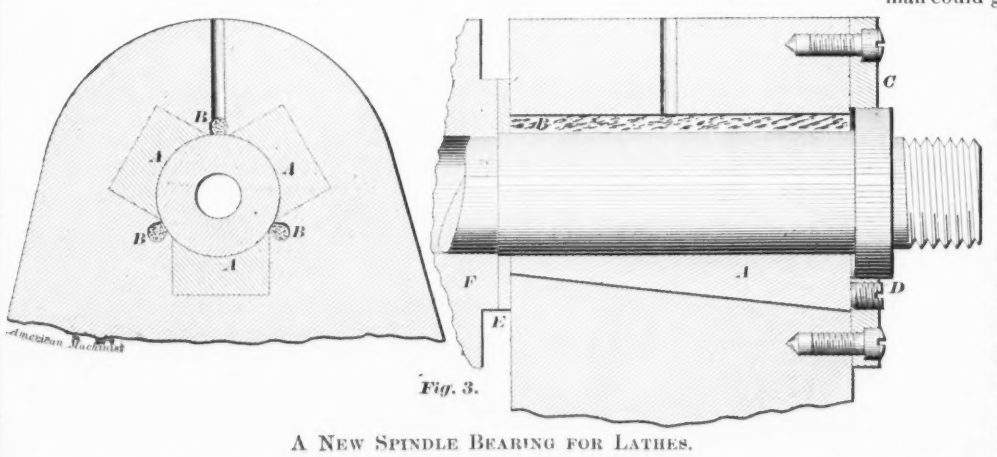


Fig. 3.

A NEW SPINDLE BEARING FOR LATHES.

Sometimes we hear of wonderful inventions which vanish about as suddenly as they appear. Here is one that I will try to tell you about, and what became of it. I saw a very happy man one morning about ten years ago. The cause of his happiness was a wonderful invention or discovery he had made to very much increase the power of a steam engine without using any more steam. It was a very simple scheme, and so one of the things he wondered at was why people had been so "thick" as not to discover it before. He was a very sociable fellow, so all the men in the shop heard all about it while the superintendent and foreman were getting over the sudden shock. The facts of the case, as he told them, were these: He had been employed as engineer in the mill for a number of years. No one had discovered that he possessed great inventive ability, until one day the owner told him that he was thinking of increasing his business, and thought he should need more power. This started the engineer to thinking, and at last he hit upon his happy thought. The scheme was to make a new piston with a convex surface, and new cylinder heads to fit, so that the piston should have greater surface for the steam to "push on." He had convinced the owner that the scheme was practical, and had got permission to have the engine built over to his own idea.

The engine was on a wagon at the door, and they were anxious that the work should commence right away. As soon as the foreman could get his breath he told the inventor that his scheme would not work. "Why not?" said the inventor. "Well," said the foreman, "I am no professor, but I say it won't work, and if you build an engine that way the engine will say the same, in a way that will be quite convincing." After considerable arguing, the inventor faded out of sight, and I don't remember of ever seeing another man who had less hope for his future than this one who was so happy only a few minutes before. I think of another case that seems to be about as crazy, and one that went further and lasted longer than the other. This time it was the foreman of the shop who made the discovery, and quite a number of engines were built with the "improvement." It was for the purpose of taking the weight of the piston in a horizontal engine. Fig. 2 will, I think, make the idea plain. It consists of a lug cast upon each side of the piston and turned with it, so as to bear against the cylinder at *A*.

This is supposed to be an accommodating lug, for it is intended to receive the steam pressure on the under side only. This foreman had had a good many years of experience with steam machinery, and perhaps this shows the extent of his skill.

To fit a piston so tight, and keep it so that the steam will get at only one side of this lug, seems to me to be quite a long way in advance of the times.

A MECHANIC.

Engineers in the Navy.

Editor American Machinist:

Your editorial comment upon the case of engineer Danforth, of the U. S N., while very good from the standpoint or view of a skilled mechanic with a Plymouth Rock ancestry and high honor and patriotism, is, I consider, entirely out when we come to view the subject in the way in which it is looked upon by our governing classes in Washington.

I know nothing about Mr. Danforth personally, but I do know that there are, and have been young men, assistant engineers in the navy, who, through much study of regulations, become better sea lawyers than engineers, often raising questions against their chiefs as to "lawful orders," for the purpose of dodging work; the chiefs do not usually make much fuss about it, but when they try it against the "deck" they usually get sat upon very promptly, as in this case.

This kind of an engineer is about what might be expected when we consider the material from which they are made. Appointed to the academy by politicians, sometimes after an examination by a board of schoolmasters, they are drilled and crammed for six years with everything except engineering, taught to look with contempt upon any manual labor except drilling with muskets, and finally those who get through, if there are not commissions enough for the deck to go around, may be appointed assistant engineers.

Real engineers are born, and not made in naval academies or technological colleges, any more than farmers are made in agricultural colleges, or Christians in theological schools. The born engineer, however, cannot keep himself out of the oil, and coal, and bilge water, and heat of our modern engine rooms, as he wants to satisfy himself by personal observation that his fires are properly cleaned, the feed water going in all right, and the bearings cool; or, if in port, that overhauling and repairs are not too long neglected; consequently he gets scented with the different oils in use, and, through weariness of body and mind, neglectful of his personal appearance. It was for the purpose of keeping out these children of nature that the present system which I have outlined above was devised, and it has been very successful.

Later on it was discovered that these troublesome engines would do no work at all unless they had men around them; so the grade of machinist was created, in imitation of some of the European countries, where they keep them to their work by a marine with a musket stationed at the head of the ladder. We "ship them before the mast," even in cases where the ship has no mast, the doctor examines them to see that they have plenty of fingers and arms to be cut off in feeling for hot bearings in dangerous places, for spare fingers have not yet found a place in the ship's allowance tables. To keep them from running away we equip them in a uniform so grotesque and unlike anything on earth, that any dog of discernment will bark until the wearer is out of reach, and then will dream of it as he lies by the fire at night. For this wonderful transformation about half a year's pay is stopped, and he may not think of looking at the beach until this dead horse is worked out. After a long time, in case he has worked hard and slept little, and not been convicted of making black marks on the deck, and not been discovered on deck trying to cool himself, and not run up against the thousand and one regulations which seem ever ready to trip him up, he may go whining to his engineer with downcast head, and his engineer will go whining to the first lieutenant to beg a few hours liberty. Sometimes he may get it and sometimes not; in case he does, he toes a mark on the port side of the deck until the boat is ready. When he comes off he may have more liquor on board than he can carry quietly. Small blame to him that it is so, for the temptations are many; and then that petty officer with the high sounding title, "master at arms," takes charge of him and keeps him in confinement in "double irons," that is, with handcuffs and leg irons, until sober.*

When his term of enlistment is up there is no chance for him to earn a living on shore; all the jobs in the navy yards are used by the politicians as resting places for their voters between elections, and after his money is gone he must ship again unless he has a very elastic nature, or some good friends to brace him up again.

There is no promotion for the machinist in the navy and no chance to study for it if there was; yet they take indicator cards and sign their names on the log, and are regarded as responsible for what takes place during the watch. In Her Britannic Majesty's service (I think that is the title) a few months ago one of these machinists was tried by court martial, and suffered loss of pay and imprisonment because a water tender at the other end of the ship allowed a boiler to go dry and the furnace crowns to come down This is the true military way of doing things—have corporals and sergeants who can never become commissioned officers so as to share in the honors and glory, to do the work, and in case of anything going wrong, which is liable to be found out by the taxpayers, you can strike them with a court-martial, and the lower down they are, and the fewer friends they have, the harder you can strike and make the more noise with the punishment.

Of course, Mr. Editor, from your point of view, these things which I have shown forth go to prove your statement that "the navy is a good place for machinists to keep out of," and so far as I have observed your advice in this matter, given from time to time, seems to be very well followed; there are very few American young men to be found there. Our engine rooms are mostly controlled by gentle Germans or subservient Swedes, who are there for the pay, or for what information they can secretly convey away for the benefit of their own governments. During our war these quiet people were making many honest dollars selling the secrets of our government drafting rooms, and they have the same opportunities to-day.

I think, Mr. Editor, that you will never see the time "when the broad general principle *will be recognized* that naval battles will be contests in which the best machines, handled by the best men, will come off victorious." It will only be after the disaster, and the only redress is perhaps to court martial a machinist for letting his crank pins get hot; and these are my reasons: As the administrations change from year to year—with rare exceptions—men are put at the head of the departments with no practical experience in any line of business, except as vote-getters or buyers. There was one boozy old failure of a lawyer, who had a reputation as a maker of terrapin stew, and it was hoped he would introduce better rations, but he passed away into obscurity, leaving no trace except the effect of his corrupt contracts, which left us for years without any navy at all, though the expenditures were enormous; consequently they pass through their terms of office leaving the management to the people they find there, get as large appropriations as they can, and reimburse themselves as best they may. If the appropriations for building are large it means more money for contractors, and the Johnny Bull riveters and frame setters in their yards. If the ships break down in passing from Newport to Bar Harbor, or some other equally perilous voyage, there is an argument for more money for the heelers in the navy yards. In short, the efficiency of the navies of this and all other countries which I have any knowledge of is measured by the amount of money which they can draw out of the pockets of the people, under the calls for means, "to defend our coasts against invasion," "protection to the honor of our flag," etc., and this is *the other point of view* to which I referred at the beginning of this letter, as that of our governing classes in Washington.

Which is the right I myself am unable to state. I used to have some pretty positive views in these matters, but find myself so much in the minority that I am coming to doubt whether I ever knew anything.

A VETERAN NAVAL ENGINEER.

*In 1842 the Commodore Perry board for appointing engineers forthe U. S. steamer "Fulton" provided that "these engineers were amenable to the discipline of the navy, with exception of corporal punishment." In 1892 we find machinist Dunlop in charge of the master-at-arms, who can iron him if so ordered. Truly the situation has not improved much in fifty years from your point of view.

Cam Rollers.

Editor American Machinist:

We frequently hear the expression, "all right in theory, but wrong in practice," or words to that effect. This no doubt arises from the fact that theories formulated upon insufficient data are quite too prevalent; for it must be obvious, I think, that if all the conditions of a problem were foreseen and duly considered, the practical demonstration must verify the theory. Mechanical motions are frequently subjected to this superficial treatment—a good illustration of which is to be found in the AMERICAN MACHINIST of Nov. 10, under the head of "Conical Cam Rollers," in which the author, Mr. W. F. Durfee, makes the remarkable statement that the cylindrical cam roller is "absolutely wrong." Now, if he will qualify his statement by telling us for what purpose it is absolutely wrong, I, for one, will forgive him, and, in the meantime, I will proceed to tell for what purpose and why I consider the *conical* cam roller absolutely wrong, and that is where great precision is required of the parts actuated by the cam under heavy pressure. For the reason that the angular surface of the cam groove, coming in contact with the corresponding angle of the roller, will tend to force it away from its proper seat in the groove, thereby shortening the intended throw of the cam. It will also create a great deal of friction between the roller and shoulder of stud upon which it is mounted, as well as upon fulcrum of lever, if motion is conveyed in that manner.

The conical roller is quite common in some localities, and when studied in an isolated state, as shown by Mr. Durfee, is a "thing of beauty," but when put in actual operation in conjunction with other parts is *not* "a joy forever." I have used it for a number of years with varying success, due to varying conditions, and am satisfied that, while it is well adapted to moving light parts rapidly, without much regard to accuracy, it can never supersede, for general use, our tried and trusty, though faulty, friend of cylindrical form.

"With all thy faults I love thee still," cylindrical cam roller.

J. N. SEVERANCE.

The Steam Pipe System at the World's Fair.

There will be many unique and remarkable features about the great power plant of the Columbian Exposition, and the fact that all piping is to a very great extent underneath the floor is one which will attract attention.

Of course the pipe connections come up through the floor to the engines, and in some cases condensers are located on the main floor, but as far as possible, or practicable, the condensers, and all steam, exhaust and water pipes are confined to the basement underneath the main floor level.

The main steam drum is located underneath the visitors' gallery, which extends out into the boiler house 20 feet on a level with the main floor of Machinery Hall, the boilers being placed on a level with the basement. The main drum is 36 inches diameter, of $\frac{5}{16}$-inch boiler iron, and extends the entire length of the boiler house and boiler house annex, 800 feet. It is divided into seven sections, the longest of which is about 150 feet long. Each section is anchored in the middle to a heavy masonry foundation, and is carried along the remainder of its length on cast iron rollers, which rest on small masonry pieces. The adjacent sections are connected by equalizing pipes of 10-inch pipe, so arranged as to take up the expansion.

The contract for five sections of the drum was let to the Porter Boiler Manufacturing Co., and for the other two to G. L. McGregor & Co., both of Chicago.

The boilers are connected to the drums by pipes which rise to the top of the boiler house, pass over and down into the headers.

Steam for the engines is taken out of the top of the drums, a separate pipe for each block of engines, and run perpendicularly to the length of the plant, and provided with laterals which connect to each engine.

Nearly all of the engines in the power plant are condensing engines, and, as stated above, the condensers are in most cases located under the floor, though those for the Westinghouse 1,000 horse-power vertical engines and some others are placed on the main floor.

Those engines which run with free exhaust have their exhaust connections run parallel to the steam, the exhaust header of each block connecting to feed-water heaters, which are located on the "visitors' gallery" of the boiler house.

The condensers are supplied with water from the seven Worthington "circulating pumps," which are located at the extreme eastern end of the power plant. These pumps have a combined capacity of about 900,000 gallons per minute, are of various sizes and styles of the Worthington make, and are loaned to the Exposition Company free of cost. These pumps take their suction from the "South Canal," about 180 feet away, and deliver into two 24" pipes which run, one on either side of the power plant, one of them extending 1 000 feet, the entire length of the plant, reducing in size as connections are taken off.

The overflows from condensers connect into one main pipe which runs along one side of the plant, its largest section being 40" in diameter.

Both the supply and overflow pipes for condensers are made of $\frac{5}{16}$-inch boiler iron, with cast-iron nozzles for connections, and cast-iron flanges at intervals for stiffening, and to facilitate the connecting up of the pipes. Jos. Bee & Co. have the contract for the supply pipes, and Excelsior Iron Works that for the overflow pipe.

Work is progressing rapidly on all of this piping. The steam drums are nearly in place, and the condenser pipes are being rapidly delivered and erected.

It is of course always somewhat uncertain to base any comment upon a mechanical matter upon newspaper reports of an occurrence, but it would seem as though the trouble experienced with a jacket for a 16" gun at Washington recently was caused by their practice of first placing the jacket over an arbor after it is heated, to determine whether or not it has been sprung crooked by the heating, so that it may not go over the tube, notwithstanding that the gauge may show that it is expanded sufficiently. During this operation in this instance the jacket seems to have cooled sufficiently to prevent its going to place on the tube. If this arbor resembles the tube of the gun, and is of the same size, the time required to place the jacket over it and remove it again may be just sufficient to make it stick on the tube when it would not otherwise do so; while, if it were made larger, to allow for the cooling between the time of trying it on the arbor and placing it on the gun, the jacket would have to be heated to a higher temperature than would otherwise be necessary. It would seem as though a gauge composed of three or more sets of arms placed upon a central shaft long enough to reach through the jacket, and made light enough to admit of rapid handling, might be used for this purpose as well as an arbor, since such a gauge would not only show the nominal diameter to which the jacket had been expanded, but would also reveal any springing that had taken place.

The many inquiries we have received relating to the book treating on Factory Management, by John Tregoning, M. E., of which we gave a notice in our issue of November 24, led us to believe that the author had changed his place of residence. To our inquiry the author replies that his present address is 32 Belmont avenue, Providence, R. I.

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☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

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Business.

About the most uncomfortable and unhappy man these days is the partisan who declared, in effect, that if the majority of the citizens of the country were found by the result of the election to differ from him in matters of politics, the country would surely and swiftly go to the eternal bowwows. The country is persistently refusing to do this, and some of the party organs, which cannot make up their little minds to accept the verdict of the country and make the best of it, are sorely tried to find instances of calamities to bear out their pre-election prophecies of dire disaster. Some of them have simply postponed the disasters to some future period, while others have given it up, and practically acknowledge that the predicted calamities are not coming according to schedule. The Pittsburgh *Commercial Gazette*, which was most active in predicting disaster if its views were not shared by a majority of the people, has been led to declare that the iron business in Pittsburgh is good, and that the prospect for new business in the engineering lines is excellent. Some of the organs will probably never be able to see such a condition, but the fact is, nevertheless, that the prospects for business are generally very good, and, so far as we can see, there is no cause whatever for discouragement. Some enterprises are being held in abeyance until it can be known what is to be done in the way of legislation on the tariff, but this would probably be the case where there was a prospect of a change in the revenue laws of any character or by any party. To say that no political party once in power can safely be deposed on account of the uncertainty resulting to business is to say that no change should ever take place, and that a party once in power should always stay in power, which, as everybody knows, would be absurd, and the most dangerous position in which we could be placed. The only thing usually which keeps parties anywhere near the straight and narrow path is the consciousness that they are very liable to be thrown out unless their legislation meets the views of the people. And even though the majority of the people may be mistaken in their views, it is well that parties know they must bow to the expressed will of the majority.

The election is over, and every really good American will stop howling about impending calamities and go to work to secure his share of the business, or to perform whatever seems to be his duty.

Engineers in the Navy.

An examination made for us by a graduate of the engineering department of the U. S. Naval Academy shows that of the 113 living graduates of the classes from '73 to '82 inclusive, 38 per cent. have resigned to take positions which they considered more desirable than serving as engineer officers in the navy, while others known to be about to resign will bring the percentage up to 40. These are men who have been educated at great expense by the government, presumably for the purpose of supplying engineers for the navy.

Such a state of affairs furnishes its own comment, and it would at least seem to be evident that the object for which the Naval Academy is maintained is not realized, this becoming the more evident when the relative standing of those who resign and of those who remain in the service is examined, one class, nine of whose members have resigned from the service, losing all of these from amongst the ten members of highest standing at graduation. We think this shows conclusively that the education given young men at Annapolis is such as to fit them for positions which are better in their estimation than those to be found in the engineer corps of the navy, and the chief reason for this is, we think, to be found in the old "line and staff fight" of which the "Danforth case" is simply one manifestation. We have made some investigation of the positions at present occupied by the men who have resigned from the service, and find that in nearly every case the position occupied necessarily demands an order of ability that would be very valuable to the navy if it could be retained in the service. In other words, the men are showing by the positions which they obtain and hold with outside concerns, or in business for themselves, that they possess ability of a high order, and that the government cannot afford to educate such men and then allow such a foolish thing as this "line and staff fight" to drive them out of the service.

The letter of a "veteran naval engineer," published in another column, takes another view of the case, and his position with regard to the fitness of the engineers graduated at Annapolis *for engineers of ships* seems to be borne out by the circumstance that none of those who have resigned as noted above are now occupying positions on board steam vessels. The position of chief engineer of a trans-atlantic liner is considered a good one, and is certainly free of most of the unpleasant features attending such a position in the navy. But the men who fill these positions have had a very different training from that obtained at Annapolis; they are machinists first, and can build marine engines, and then learn in actual service how to manage and care for them on board ship. They know thoroughly just how to get the most possible out of a marine engine. We think that theirs is the best sort of an education for men who are to manage and have charge of marine engines, but such men will not manage marine engines unless they can have control of them, and so long as the plan of training men for engineers by teaching them in a school is pursued, then we think such means should be adopted as will retain them in the service after they have graduated. It is evident that the present plan is not retaining them.

The education given at Annapolis is, we believe, a good one, and the men who secure it may consider themselves fortunate, but our investigation convinces us that this education does not fit them for marine engineers any more than for a dozen other positions connected with engineering science, and in fact that the training and education obtained better prepares them for any one of a dozen or more different occupations that it does not pretend to fit them for, than for marine engineers, which it does pretend to fit them for.

We publish also in another part of this issue some abstracts from the recently issued report of Commodore Melville, which states some of the reasons why good men are not retained in the navy. Few who know anything of Chief Engineer Melville will doubt that he knows just what the trouble is, and his language is plain enough to be easily understood.

The great benefit that may result from a meeting together of employers and employes, or their representatives, to discuss candidly any questions that may arise concerning their mutual interests, is shown by the experience of M. Julien Weiler, engineer of the Department of Material of some extensive coal mines in Belgium. In these mines representatives of the employers, usually chosen from their employes occupying positions of responsibility, regularly meet representatives of the men employed in the mines for the purpose of arriving at a mutual understanding regarding any differences which may arise or may seem likely to arise. After as complete an understanding of the facts bearing upon a given question is acquired as seems possible, the matter is discussed, and finally a vote taken upon it, the conclusion thus arrived at not being binding, and yet observed by mutual consent in every case for the four years during which the plan has been in operation.

A difficulty which was anticipated was that, when the men came to choose their representatives, they would choose, not the wisest and best men, but the worst and most unreasonable. This seemed realized, when, as their first representatives, they chose the very men whose influence the mine operators had most feared and regretted. Yet, when these men were better known, they were found to be much better than was expected, so that preconceived ideas of them had to be abandoned, their good qualities now showing forth—qualities which before had been in the shade, while their faults only had been seen, "and these through a magnifying glass."

A favorite occupation of railroad companies is the "appropriation" of land or its occupancy without the formality of first obtaining a valid title to it, trusting to various forms of sharp practice to retain possession of it afterwards. The New York Central road has recently been compelled to relinquish its hold upon some valuable land in Yonkers which it had appropriated to its use; among the rightful owners being D. Saunders' Sons, who are well known to our readers. In Chicago, the Illinois Central road has recently been beaten by the city of Chicago in a contest for the possession of land along the lake front, worth a million dollars or more, part of this land being now likely to be used for the construction of public docks, which will pay a revenue to the city and tend towards freedom of commerce, instead of towards monopoly, as it undoubtedly would have done in the hands of the railroad company.

A movement is on foot and well under way for the establishment of an association of traveling engineers and road foremen of engines. A preliminary meeting was held in Chicago, November 12, the result of which is a call which has been issued for a meeting at the office of *Locomotive Engineering*, 912 Temple Court, New York, on Monday, January 9. The call is signed by thirteen men connected with prominent roads, and the invitation to meet includes all men employed in the positions named. John A. Hill, who is acting as temporary secretary, may be addressed as above for full particulars.

An epidemic of anonymous correspondents seems to have broken out recently again, and it seems to be necessary for us to again remind our readers that we pay no attention to communications of any kind unless we know the full address of the writer. All anonymous questions and communications of every description go direct to the waste basket.

Literary Notes.

A TEXT-BOOK OF EXPERIMENTAL ENGINEERING. For Engineers and Students in Engineering Laboratories. By Rolla C. Carpenter, M. S. C. E., M. M. E., Associate Professor of Experimental Engineering, Cornell University.

This work describes the principal standard methods which have been from time to time adopted by various engineering societies for the testing of materials, engines and machinery. The book is, however, chiefly intended for use in engineering laboratories, and presents information which the experience of the author has shown to be necessary to carry out experiments intelligently, and without great loss of time on the part of the experimenter. It deals principally with educational methods, use of apparatus, and the preparation required for becoming a skilled observer. It gives in a brief manner, in connection with each experiment, a statement of the theoretic principles involved, a description of apparatus or machines used in the experiment, and a full statement of the methods to be employed, followed by forms for data and report. All the subjects are admirably treated and arranged, making the whole an excellent book of reference for the practicing engineer, as well as for the student. The book is divided into twenty-two chapters, treating on the following subjects: Reduction of Experimental Data; Apparatus for Reduction of Experimental Data; General Formulas—Strength of Materials; Testing Machines—Strength of Materials; Methods of Testing Materials of Construction; Friction—Testing of Lubricants; Measurement of Power; Measurement of Liquids and Gases; Hydraulic Machinery; Definitions of Thermodynamic Terms; Measurement of Pressure; Measurement of Temperature; Methods of Measuring Moisture in Steam; Heating Value of Coals—Flue gas Analysis; Method of Testing Steam Boilers; The Steam Engine Indicator; The Indicator Diagram; Methods of Testing the Steam

Engine; Engines for Special Uses; Experimental Determination of Inertia; The Injector and Pulsometer; Hot-air and Gas Engines. The book is published by John Wiley & Sons, 53 East Tenth street, New York. Price, $6.

QUESTIONS AND ANSWERS.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(553) W. C. W., Galt, Canada, writes: Could you tell me where to get a book that would give me information in regard to repairing bicycles, brazing, cementing tires, etc.? *A.*—We do not know of any book that treats on this subject.

(554) E. J. H., Grand Rapids, Mich., asks: In order to become a good mechanical draftsman is it necessary to have a knowledge of algebra, geometry and trigonometry? *A.*—Yes; the services of a draftsman with a good education are certainly more valuable than those of one with an indifferent education. 2. Is a knowledge of electricity of any use to a mechanical draftsman? *A.*—Yes; in fact, when he has to construct electrical machines a knowledge of electricity is indispensable. 3. What kind of wages does a mechanical draftsman receive? *A.*—That depends on his ability nd energy; there are no regular rates of pay for draftsmen. Some receive as much as $4,000 per year; others very much less.

(555) C. B. P., Raleigh, N. C., writes: Please favor me with a reply through your columns as to the following: Does the piston stand still momentarily when the pressure at one of its faces is equal to that on the other face until again taken up by the momentum of the crank-pin? *A.*—No; the momentum of the piston, rod, etc., causes it to move towards the end of the stroke. 2. I contend that at some part of the stroke the piston does stop, but others think differently; please settle the dispute for us. *A.*—Some contend that the piston stops at the ends of the stroke, others dispute it, but whether the piston stops at the ends of the stroke or not is of no practical importance or value whatever, and it seems to us that debates on this subject generally result in a waste of time.

(556) Inquirer, Canton, O., writes: Can you give me a good receipt for mixing the cement used in concrete sidewalk lights; also one to cement the ordinary bull's-eye glass for the same purpose? *A.*—A mixture of tar and sulphur of the consistency of putty is often used for the purpose. Another cement is made of soluble glass, thoroughly stirred and mixed with fine chalk, and the coloring matter well incorporated. As soluble glass can be kept on hand in liquid form, and the chalk and coloring matter are permanent and cheap, the colored cements can be readily prepared when wanted, and the material can be kept in stock ready for use at but little expense. If a black color is required, use for the coloring matter well-sifted sulphide of antimony. Another kind of cement is made of litharge and red lead, equal parts, mixed thoroughly and made into paste with concentrated glycerine to the consistency of soft putty. This cement takes some little time to dry, but turns almost as hard as stone, and is fire-proof and water-proof. Any of these cements you may use for the purposes mentioned.

(557) R. C. P., Cumberland, Md., writes: Inclosed please find a circular relating to a patent slide valve of my own invention. The valve slides on one of its edges, which is narrower than the upper one, giving to the valve the appearance of a frustum of a wedge. This valve works in a corresponding V-shaped seat. The purpose of the invention is to remove all the valve pressure not necessary to the working of the same. The valve has been working satisfactorily in a stationary engine in this city for nine months, an engine of 20 horse power. Inferring that you are thoroughly acquainted with steam engine construction, and interested in improvements of the same, I would be pleased to have your opinion of its operation when applied to large engines and locomotives. You will observe that the whole object of the construction of the valve seat and valve upon this principle is to get sufficient length in the ports with a small top area of the valve. *A.*—Your idea is by no means a new one; valves of this form have often beeen tried, and as often abandoned. They seem to work well in the beginning, but in time they either wedge themselves fast in the seat, or leak. The manner in which you apply the valve and seat as shown in your illustration increases the clearance, which in many engines is an objectionable feature. We regret that we cannot express a favorable opinion of your invention.

(558) E. P. P., Deckey, Ga., writes: I wish to get a little information in regard to testing boilers by cold water pressure. I bought of a New York firm one of their boiler test pumps, with which I have tested a number of boilers. On last February 2d I tested a 20 horse-power boiler, locomotive type, to 140 pounds cold water pressure. This boiler carries an average of 80 to 90 pounds steam pressure. A short time ago the bottom of the fire box was found to be very thin, and gave way under the hammer test. It was found to be very badly rusted, and must have been in this condition when tested. Now the point I do not understand is, why the fire box did not give way under the cold water test, as I supposed that was what the machine was for. I wrote to the manufacturers of the pump, but the only satisfaction I could get from them was that "the machine had done its duty." I have another boiler to test, same age, size, etc. Will I be safe in applying the cold water pressure, or shall I make a thorough test with a hammer? The point I wish to get at is, how am I to determine whether or not the boiler is safe, for the test pump has failed me in the instance above related. *A.*—Your test pump has not failed, but has done its duty, as the manufacturers said. It showed that the boiler would stand a pressure of 140 pounds at the time it was tested, but this does not prove that the boiler is a safe one to use. Before the test pressure is put on, the boiler should be thoroughly examined, tested with the hammer, and every means employed to detect weak spots, broken braces, stay-bolts, etc. If any thin spots are found, or defective braces, etc., we see no use of using the test pump, but the boiler should be condemned until the necessary repairs are made. On the other hand, if a thorough examination reveals no defects, then use the test pump to make sure that nothing has been overlooked, and that all the joints are tight.

(559) A. H. U., Auburn, N. Y., writes: In our power plant here (we run an electric railway) we have two 100 horse-power tubular boilers in good condition. We use only one at a time. The feed water is taken from a hot well of the condenser. The water, as a rule, has a fair proportion of lime, and, of course, makes a scale, but not enough to cause trouble. We change off on boilers every four weeks. For a scale preventive we have used an extract of oak bark obtained from the tanneries about here, and lately have used a compound called tri-sodium phosphate. They both give good satisfaction. The oak extract leaves the deposit in form of mud, and leaves the surface of the iron bright. The other leaves the scale in flakes, but does not leave so clean a surface. Can you give us any facts in such cases, and what can you say in regard to the wearing effects on the iron? We are aware it is not your policy to favor any particular brand of goods, but thought you might have had experience in such matters, more so than we have, and could give us the benefit. *A.*—The oak bark contains tannic acid, which decomposes the lime salts and forms tannate of lime, which is insoluble at first, and forms a scum which should be removed by surface blowing off. The remaining soluble constituents should also be blown off frequently, as their concentration is liable to tell severely on the iron unless the acids be neutralized by sufficient alkaline substances purposely introduced. There is danger of the tannic acid attacking the iron, and you will probably find that when the plates are allowed to become dry their surfaces will not be bright, as you say they are, but will have a dark, dull color, covered with fine dust, which may be taken as an indication that corrosion, to some extent, has been going on. In all cases where tannic acid is used its effect on the plates and tubes should be carefully watched. As to the compound to which you refer, we should hesitate in using it without having it and the water analyzed, so as to be certain that no injurious effect will result from its use. We have heard so many good reports from the use of kerosene that we should certainly try it in preference to all other scale preventives. Use about one quart per day to each boiler, blow down to two gauges every week, and the entire contents every month. Use asbestos wicking dipped in boiled oil, and then squeezed dry, for packing in the glass water gauges.

(560) M. C. F., Detroit, Mich., writes: Kindly answer the following questions through your columns: 1. In what number of the AMERICAN MACHINIST did you give rules and illustrations of laying down the center lines of the Joy valve gear? And can I get that number? *A.*—November 13, 1890; we can supply you with a copy of this number at any time. 2. Please give me a rule by which I can determine the amount of throw to give to an eccentric when the eccentric rods do not come directly under the valve rod as shown in sketch. I have consulted several authors on the subject, and they give the valuable information that it must be either larger or smaller than the travel of the valve, which is, of course, a good thing to know. Kindly show the construction so that it will be easily understood. *A.*—So many elements enter into the solution of a problem of this kind that it becomes a very complex one, and involves more labor and time than its importance justifies. In many engines the valve travels a little beyond the steam ports, in others the valve does not quite open the steam ports to the admission of steam, because as great a port opening is not required for the admission of steam as for the exhaust. From this it will be seen that within a certain limit we may change the travel of the valve without any injurious effects. Hence, under the given conditions we should give the valve a travel such as will allow it to move say $\frac{1}{8}$ or $\frac{1}{4}$ inch beyond the inner edges of the steam ports when the link is in full gear, or, in other words, when the valve rod is practically in line with the eccentric rod. The eccentricity of the eccentric under these conditions will be equal to the sum of the lap, the width of steam port and the amount the valve is to travel beyond the inner edge of the steam ports; the required lap is easily found by the method given in our issue of May 1, 1890. Of course moving the eccentric rod away from the valve rod, or, in short, hooking up the link to a slight degree, so as to meet the conditions in your example, will reduce the travel of the valve and also affect the point of cut-off, and if it is desirable not to change the latter for a given position of the link we should ascertain the reduction of the travel due to the position of the link by means of a model which can readily be made from stiff paper or thin strips of wood, and then adjust the lap to suit the reduced travel by the method given in our May issue above referred to, leaving the eccentricity of the eccentrics unchanged. The above applies only to cases in which the link connects to the valve rod direct.

(561) W. H. M., York, Pa., writes: In your issue of March 3, 1892, you have a recommendation for the steam pressure and horse power indicator by Mr. W. Cox. I always like to have any labor-saving device, if it is good and reliable, but I find this indicator to be all wrong, or I do not properly understand it. In order to find out who and what is wrong, I give the following example: Engine, 12x30 inches; steam or boiler pressure, 90 pounds; runs at the rate of 100 revolutions per minute, and cuts off at $\frac{1}{3}$ stroke. Now first let us find the mean effective pressure and horse-power with the indicator. Set the zero of the cut off scale to 90 pounds, and opposite the given cut-off we find $62\frac{1}{2}$ pounds as the mean effective pressure. Now set the stroke in feet (which is $2\frac{1}{2}$ feet) to the diameter of the cylinder in inches, then set the arm to the arrow, then bring the pressure of $62\frac{1}{2}$ pounds to the arm, and set the arm to the arrow again, and bring the revolutions per minute to the arm, and opposite the given cut-off we find 76 as the horse-power of the engine. Now this is way off, unless I made mistakes in working the indicator. Let us find the mean effective pressure and horse-power by computation. To find the mean effective pressure, add to the steam pressure of 90 pounds the atmospheric pressure of 14.7 pounds; multiply this by the hyperbolic logarithm of 3 plus 1, and divide by the number of expansions (3). The hyperbolic logarithm of 3 is 1.0986, and $90 + 14.7 = 104.7$, hence we have:

$$\frac{104.7 \times 2.0986}{3} = 73.24 \text{ pounds.}$$

From this take the back pressure—which we will take at its best, with a very free exhaust, at 15 pounds—and we obtain a mean effective pressure of 58.24 pounds, and not $62\frac{1}{2}$, as found by the indicator. The area of a 12 inch piston is 113.09 square inches, and the piston speed of a 30-inch stroke engine running at the rate of 100 revolutions per minute is 500 feet, and the horse-power of this engine will be $\frac{113.09 \times 58.24 \times 500}{33{,}000}$ = 99.79. Here is a discrepancy of 23.79 horse power, and I would be very much obliged to you for indicating the mistake. *A.*—We submitted this question to Mr. William Cox, the inventor of the indicator, who replies as follows: "Your correspondent has simply made a mistake of taking the cut-off twice over; firstly he obtains the average pressure of 90 pounds with $\frac{1}{3}$ cut-off, namely, $62\frac{1}{2}$ pounds, then, after effecting the various operations with the indicator, he takes his horse-power from $\frac{1}{3}$ cut-off, instead of from zero. If he will take it from zero he will see at once that it has 107 horse-power. The better plan in order to avoid mistakes is to start with his initial pressure of 90 pounds, and read the horse-power from $\frac{1}{3}$ or any other given cut-off. He will then see that, making due allowance for back pressure, the result, namely, 107 horse-power, obtained with my indicator, is about the same as the one he obtains by calculation."

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Grant's Gear Advertisement is always on page 11.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Ct.

Ideal Drawing Stands. M. C. Hammett, Troy, N.Y.

$10 Countershafts. A. D. Pentz, Elizabeth, N. J.

Tool Holder: Armstrong Bros. Tool Co., Chicago.

New lists of cutters. Brown & Sharpe.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N.Y.

The Improved Justice Hammer. Williams, White & Co., Moline, Ill., manufacturers.

Pattern and Brand Letters. A variety of sizes and styles. Heber Wells, 8 Spruce St., New York.

Drill Presses, with Tapping Attachments.
Gould & Eberhardt, Newark, N. J.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty St., N. Y.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N.Y.

S. A. Smith, 23 S. Canal St., Chicago, Ill., is agent for Standard Tool Co.'s Twist Drills.

Pulley lathes, most efficient offered. The Lodge & Shipley Machine Tool Co., Cincinnati, O.

Castings for small and medium-sized vertical engines. Humphrey's Foundry, Bellefontaine, Ohio.

Clayton Air Compressor Works, 43 Dey St., N. Y. Compressors for experim'ts to 300 lbs. pressure, $50.

For Cypress Tanks and Vats, address W. E. Caldwell Co., Floyd and Main Streets, Louisville, Ky.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

"Shapers (Double Triple Quick Stroke")
Trade Mark.
Gould & Eberhardt, Newark, N. J.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Most sensitive and durable Damper Regulator made; works within one pound. Send for circular. T. Kieley, 11 W. Thirteenth Street, New York.

For the Latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., cor. Canal and Washington Sts., Chicago, Ill.

Patterson, Gottfried & Hunter, Limited, 146-150 Centre st., New York, are putting on the market a new alarm speed indicator. Send for circulars.

We electrotype illustrations and advertisements for manufacturers. Prompt and thorough service. Send for estimates. A. Mugford, Hartford, Conn.

Gear Cutters, Auto. Specially adapted for Motor Gears and all other style Gears.
Gould & Eberhardt, Newark, N. J.

S. W. Card & Co., Mansfield, Mass., are putting on the market a new line of stocks and dies, with their patent adjustable dies and guide. S. A. Smith, 23 S. Canal Street, Chicago, Ill., Western Agent.

Patent Soliciting of High Class.
D. Walter Brown, Counsel in Patent Cases,
31 Nassau Street, New York.
Send for Brief History of Patent Legislation.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. AMERICAN MACHINIST PUBLISHING CO., 203 Broadway, New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

Sensitiveness of Touch.

In our issue of July 21, 1888, we published an editorial article going to show to what extent the human hand could be trained to measure small differences in magnitude; to detect slight variations in weight; and in texture of a surface. The things mentioned at that time seemed wonderful enough, and, in fact, almost incredible; but we have recently noticed an instance of extreme delicacy of touch which seems still more wonderful, and yet the circumstances are such that there can be no mistake about it, and we must accept as a fact that the human fingers can be trained to detect variations of magnitude or form very nearly if not quite as minute as can be detected by the best calipers. The facts of the case are as follows:

During the week of the dedication of the Exposition buildings, at Chicago, Mr. Ambrose Webster and a well-known manufacturer of hardened steel balls were there, and were met one evening at the hotel by the president of the AMERICAN MACHINIST Company. The subject of ball bearings was introduced, and the ball manufacturer, taking a hardened and ground ball from his pocket, handed it as a specimen of his work to Mr. Webster, who, rolling it between his fingers, remarked: "Why don't you make them

round?" "It is round," was the reply, to which Mr. Webster answered, "No, it is not round—I can feel that it is out of round." The manufacturer was unable to detect any want of truth, and the result was a trifling wager between he and Mr. Webster, who said that if allowed to take the ball home he would measure it, and determine whether or not it was true, and how much it was out, if at all.

A few days since Mr. Webster called at this office, armed with a fine micrometer caliper, made by A. J. Wilkinson, of Boston, and said: "I am now prepared to win the wager made in Chicago, as I can demonstrate that the ball is not round. It has around it what may be termed an equatorial line which stands above the surface of the ball, or, in other words, there is a belt extending around it, the diameter of which is greater than that of the ball when measured at any other point than through this belt; and I can pick it out every time by the sense of touch, and place it in the caliper so that it will not pass through, though the caliper be set so that the ball will easily pass through when turned, so that this belt or equatorial line does not come into contact with the screw."

This Mr. Webster was successful in doing at every attempt; and Mr. Fred J. Miller, our Associate Editor, who was called in to see what he regarded as a remarkably delicate sense of touch, found after a few trials that he could himself easily detect the belt by rolling the ball in his fingers, and demonstrated that he did so by placing it correctly in the calipers at every trial.

Mr. Webster, again taking the ball and rolling it between his fingers, said there was one feature about it that he had not before noticed, *i. e.*, there seemed to be at a certain point in the belt a slight projection, or, as he described it, a mountain; and after a little examination both he and Mr. Miller demonstrated that they could define the location of this mountain by the sense of touch, and they both placed the ball in the caliper repeatedly so that it just touched, when, if turned very slightly from that position *in any direction*, it would pass through without touching.

A bench measuring machine in Mr. Webster's shop at Waltham (The American Watch Tool Co.), showed that the ball, which was ⅜" nominal diameter, actually measured through its smallest diameter .37512"; through the mean or ordinary diameter of the belt, .3752", and through the mountain and belt, or its largest diameter, .37539". Thus it is seen that the ordinary diameter through the belt is .00008" greater than through the smallest part, and that the mountain is .00019" above the belt, the diameter measured through the mountain being .00027" greater than the smallest diameter. The tests showed, we think conclusively, that a variation in size or shape amounting to less than one ten-thousandth part of an inch can be detected by the fingers, where, either naturally or by training, the sense of touch or the sense of magnitude is highly developed. So far as the matter has been investigated, it does not seem that such sensitiveness is at all common, very few persons being able to detect any variation or departure from sphericity, or, where they think they do detect it, they fail to prove it by placing the ball in the caliper correctly.

An Unique Proposal.

A man who lives in Butte, Montana, and is superintendent of a mining company there, makes an offer to the U. S. Treasury Department which is very suggestive, and ought to enable large numbers of people to see new light on the "silver question." Mr. Allen's offer is to make for 90 cents apiece any number of better silver dollars than are now being coined by the mints. He places the intrinsic value of the present silver dollar at 65.71 cents, containing 371¼ grains of silver; he proposes to put in his dollars 400 grains of silver, and would number and letter each coin so that the government would not have to redeem duplicates—a precaution which is at present neglected, and which would seem to be important in view of the fact that a counterfeit dollar can at present be made of coin silver, an exact duplicate in every respect of the genuine coin—a counterfeit which cannot be detected—and a large profit made out of the operation, since 65 cents' worth of silver will make a dollar's worth of coin; $650 worth $1,000 coin; $6,500 worth $10,000 coin, etc., and the dollars so made would absolutely defy detection; in fact, there is no telling but what they have been made in large numbers, and will have to be redeemed at their face value.

Aluminum Solder.

A new soldering metal for aluminum has been prepared by Mr. Alexius Rader, of Christiania, Norway. It consists in combining cadmium, zinc, and tin mixed in substantially the following proportions: Cadmium, 50 per cent.; zinc, 20 per cent.; tin, the remainder. The zinc is first melted in any suitable vessel, when the cadmium is added, and then the tin in pieces. The mass must be well heated, stirred, and then poured. This soldering metal can be used for a variety of different metals, but is specially adapted to aluminum.—*Engineering.*

Most of us laugh at the homely mule and admire the lordly lion, although one good mule is worth a thousand thieving lions. Most of us have laughed at the mule which attempted to look like a lion and was whipped by his master for the nonsense. There is something wrong in the public sentiment which caused that useful mule to aspire to be a worthless lion. There is too much disposition among the people to admire the worthless ideal, and make light of the useful reality.—*Atchison Globe.*

The World's Fair commissioners are, at this writing, busy in allotting space to the various applicants. There have already been 7,000 applicants from this country.

MANUFACTURES

Charles Lowe is to build a new mill at Costigan Me.

The Lynn Cycle Co. has been organized at Saco, Me.

The Milwaukee (Wis.) Chair Co. will build a new factory.

The Patterson Glass Co., Muncie, Ind., has organized.

The Standard Supply Co. has been incorporated at New York.

The Chemical Paper Co., Holyoke, Mass., is making additions.

There is a plan to erect a new paper-mill at North Anderson, Ind.

The Cabot Co., Brunswick, Me., is making a five-story addition.

Dr. J. F. Hill, of Augusta, Me., will establish an electrotype foundry.

New machinery has been put in the Lebanon, (Penn.) Shoe Factory.

At Plainfield, Vt., the thread-mills are having an addition made, 80x30 feet.

The King's Mountain (N. C.) Manufacturing Company may put in fifty looms.

The M. I. Wilcox Cordage and Supply Company, of Toledo, O., is to erect an addition.

The Golden Rod Silk Company has been organized at Paterson, N. J., with capital $50,000.

The certificate of incorporation of the Scott Manufacturing Company, of Bloomington, Ill., with a capital stock of $5,000, has been filed.

Milford, Mass., has raised the necessary amount to secure the location of the Clapp, Huckins & Temple factory. The new buildings will be put up at once.

The newly chartered Hanover Match Company at York, Pa., will erect a mammoth building, and when in full operation will employ about 100 hands.

A party desirous of establishing a $30,000 plant for the manufacture of soap is in correspondence with the Chester (Pa.) Board of Trade, with a view to locating.

Plans have about matured for the starting of a tin factory in Seattle, Wash., with a capital of $35,000. The plant is to manufacture tinware of every description.

The Berlin Iron Bridge Co., of East Berlin, Conn., have the contract for three new iron buildings and iron roofs for the East River Gas Co., to be built at Ravenswood, L. I.

H. C. Lord and James Pinder, of Alfred, Me., will erect a portable saw-mill on a timber lot they have recently purchased in that town, and which they intend to strip this winter.

The Pittsburgh (Pa.) Typewriter Company has been granted a charter. It is understood the new concern proposes to engage in the manufacture of typewriters of a new design.

The Caldwell Boiler Co., 15 Cortlandt street, N. Y., has been awarded the contract for supplying 600 H. P. boilers in the Metropolitan Realty Company's new fourteen-story building.

A plant for the purpose of manufacturing tinplate is soon to be established at South St Paul Park, Minn. The company was incorporated at Chicago, with a capital stock of $200,000.

The Pratt & Whitney Co., Hartford, Conn., has issued a new price list. It is quite complete, and must prove a great convenience to those proposing to purchase such goods as this company makes.

Among the improvements contemplated in Paterson, N. J., are the addition of a wing to the mill of John Royle & Sons and the enlargement of the paper-box establishment of Frederick Harding.

Tracy Bros. have made a contract with the Copewell Horse Nail Company, of Hartford, Conn. (E. C. Lewis, of Waterbury, Conn., president), to build a factory building, about 100x225 feet, to cost about $40,000.

Old Orchard, Me., is assured of its proposed bolt factory. The old electric light station has been purchased, and it is thought that operations employing 25 hands will be commenced before the close of the year.

The Downs Manufacturing Company, of Bloomington, Ill., are considering the question of moving their plant to Ellwood, Ind. A flattering offer has been received from that city, and in all probability it will be accepted.

The Burpee Granite Co., late of St. John, N. B., have broken ground and are at work on the foundation of their granite works, to be removed to Calais, Me. The main building will be 220x50 feet, with a boiler house in addition.

The E. C. Church Company has been organized in Waterbury, Conn., to manufacture, buy, sell and deal in iron, steel, brass and other materials. The capital stock is $6,000, 240 shares of $25 each. E. C. Church, of Providence, is secretary.

The Plummer Company has been organized at Bath, Me., with a capital stock of $100,000, for the purpose of carrying on a lumbering business. The officers are: President, Edward Plummer, of Lisbon Falls; treasurer, Galen C. Moses, of Bath.

The Indianapolis (Ind.) Cabinet Works are negotiating for one of the most extensive electric plants in the West. The plant will include sixty motors to run different machines, and an electric light plant which will furnish 400 incandescent lights and 20 arc lights.

Mr. Bernard Holz recently completed at 1119 and 1121 Sycamore street, Buffalo, N. Y., a new factory 175 feet long by 45 feet wide, in which he will make a specialty of brass and bronze castings, brass model making, and plumbers' brass work of every description.

The plans for the new mill of the Rumford Falls (Me.) Sulphite Company are nearly completed. It will have a capacity of over twenty tons per day, and will be located on the whole of mill site No. 3, and the northern half of mill site No. 2, adjoining the paper-mill.

The chimney of the new Otis Falls (Me.) pulp-mill on the Androscoggin will be 185 feet high, twenty feet brick, the remainder steel. One of the largest paper machines in the world is being put in at this plant. A sulphite mill and another paper-mill will be built in the near future.

The Ohio Molding Manufacturing Company, of Cleveland, O., was incorporated by Frederick Zimmerman, Philip Decumbe, J. F. Fisher, R. Fisher, and Theodore Schmidt, recently. The capital is $10,000, and the company intends to manufacture molding for interior decorations.

The National Starch Manufacturing Company, of Indianapolis, Ind., recently commenced another improvement, which will cost several thousand dollars. The improvements to the plant this year will reach $75,000, and next year fully as large a sum will be expended in enlarging the works.

Ogden, Utah, is to have a glass factory. It will cost, it is said, $200,000, and be completed by January 1. J. D. Smith is the senior member of the company controlling the enterprise. They have bought 25 acres of land, and excavations for the buildings have already commenced. It is reported that sand of a superior quality for glass making is plentiful in Ogden.

The Monson Hillside Slate Company has been organized at Portland, Me., with the following list of officers: President, Albert H. Davenport, Boston; treasurer and counsel, Benjamin G. Ward, Portland; directors, Albert H. Davenport, John J. Gerrish, of Portland; Gilman A. Lowe, of Boothbay; James DeWolfe, of Portland; Richard J. Jones, of Monson; Clark B. Dunton and Benjamin G. Ward, of Portland.

A company capitalized at $50,000 has been incorporated for the development of a coal mine at Perry, Me., by the following persons: John B. Curtis, J. H. Fletcher, James N. Winslow, Edward D. Crocker, W. H. Waldron, Edward C. Hersey, Francis A. Waldron, Charles P. Waldron and Wilbur F. Trask, who are now in possession of about one hundred mineral deeds in the adjoining towns of Perry, Pembroke and Robbinston.

Mr. Charles F. Elmes, of Chicago, Ill., informs us that after January he will be located at his new works, corner Morgan and Fulton streets, Chicago, where he will have improved facilities for handling work, including a 20 ton traveling crane and a 10-foot boring and turning mill, etc. Mr. Elmes' shops are called the Charles F. Elmes Engineering Works, and are devoted to general machine work.

The Billings & Spencer Co., of Hartford, Conn., are building new shops, one wing of which is 250 feet long, 40 feet wide and two stories high, with basement; and the other wing, on Russ street, is 110 feet, two stories and basement, including also an office building 40 feet square, which is three stories and basement. This, when completed, will give much increased capacity and better arrangement for the execution of their rapidly growing business.

A. G. Brown, an American engineer well known in this country, and of whom we have had frequent occasion to write in connection with John Musgrave & Sons Co., of Bolton, England, has started a company to bring his inventions—engines, boilers, air pumps and condensers, and a variety of other things connected with steam engineering—more prominently before the public. The company is also selling a good many American goods. The location is 38 Victoria Buildings, Manchester, England, and the name The Globe Engineering Company.

The Hall Manufacturing Company has been organized in Rockland, Me., for the purpose of owning, selling and leasing of all patents that have been or may be procured relating to fasteners for axe handles and handles of edge tools generally, by Hiram Hall, Jr., of South Thomaston, the manufacture and sale of such fasteners and handles and all kinds of wares relating to the business as stated. The amount of capital is $225,000, and the par value of shares is fifty dollars. The officers of the company are: C. E. Littlefield, president and treasurer; directors, C. E. Littlefield, Hiram Hall, Jr. Samuel H. Hix.

The H. S. Hires Company, of Baltimore City, was incorporated December 3d by Edward A. Burke, Harry S. Hires, Thomas C. James, John P. Judge and M. A. McCormick, for the purpose of manufacturing plumbers', steam and gas fitters' and machinists' specialties. The company owns a number of valuable patents, among them the M. & L. patent improved double cone compression shaft coupling. The incorporators are the directors for the first year. The officers are Edward A. Burke, president; M. A. McCormick, treasurer; H. S. Hires, secretary and manager. Capital stock, $50,000.

The Reed & Curtis Machine Screw Co., of Worcester, Mass., write us: "Your readers might be interested to know that we have just completed the erection of a brick building 200 feet long by 40 feet wide, three stories high, with basement under the entire shop. This is a thoroughly well-built, substantial and well lighted building, designed especially for our line of manufacture, and in which provisions are made to double our production. Our principal business is the manufacture of fine special machine screws. We also manufacture the Curtis patent bicycle pedal, and other bicycle parts. We have orders booked for over 8,000 pairs of these patent pedals, which are yet unfilled."

George B. Grant, of Lexington, Mass., writes us as follows: "I have leased premises in the heart of the city of Philadelphia, at 125 South Eleventh street, within two minutes' walk of either Market or Broad street, and about five minutes from the City Hall and the Pennsylvania and the Reading depots, where I shall maintain a branch gear shop. The shop will not be merely an agency for selling the goods made at the Lexington shop, but will be fully equipped with tools, in charge of experienced men, for making and cutting all descriptions of gear wheels. My object is to accommodate my many customers in the Middle States, and to secure new business that cannot be conveniently sent to my headquarters in New England."

The Phœnix Iron Works Co., of Meadville, Pa., are now employing 160 men in the manufacture of engines and boilers. Three engines are now in process of construction in the shop, intended for their exhibit at the World's Fair next year in Chicago. The exhibit will consist of three of their "Dick & Church" engines, viz., a simple cylinder high-pressure engine of 250 H. P.; a tandem compound condensing engine of 250 H. P., and a four-cylinder triple expansion engine of 500 H. P. Their exhibit will operate four Eddy generators, to furnish power to exhibitors through electric motors. The engines will be of the extra heavy "street railway" type. The main machine shop at the Phœnix Company's Works is just now being fitted up with a new floor, consisting of 6-inch cedar blocks set on end, and lower ends dipped in tar, these placed over two thicknesses of oak plank, crossed, and these placed on a substratum of cinders. Light tools stand directly on this floor, while heavy tools are placed on masonry foundations.

Machinists' Supplies and Iron.

NEW YORK, December 17, 1892.

Iron—American Pig—We quote Standard Northern brands, No. 1 Foundry, $15 to $15.50; No. 2, $14 to $14.50; Gray Forge, $13 to $14. Southern brands of good quality are obtainable at $15 to $15.50 for No. 1 Foundry; $13.50 to $14 for No. 2; and $12.25 to $13 for Gray Forge.

Scotch Pig—Coltness is quoted at $21; and $20 for Eglington.

Antimony—The market is dull. We quote L. X., 11c. to 11⅛c.; Cookson's, 11⅜c. to 11½c.; Hallett's, 10¼c. to 10½c.

Copper—Some business has been done in Lake Copper at 12 30c. to 12⅝c., and it is claimed that these prices will still buy, although 12½c. is asked. Casting Copper is held at 11⅛c. to 11¾c.

Lead—The market is a little more active at 3.75c. for car-load lots, with important quantities obtainable at 3.70c.

Lard Oil—Prime City is quoted at 85c. to 86c.; Western on spot at 83c. to 85c.

Spelter—The market is dull; 4.40c. is asked, but there is a want of business.

Tin—The market is improving; sellers are now asking 19.80c. for delivery this month. Buyers are cautious.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. Seven words make a line, and the address as desired to appear should be included. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Wanted—A good jobbing snap molder. Address Wickes Brothers, East Saginaw, Mich.

Wanted—Draftsman and machinist (25) desires a change. Address A., care AMERICAN MACHINIST.

Wanted—Situation by first-class assistant draftsman; best refs. Address Box 68, AM. MACHINIST.

Norwegian draftsman (20.) familiar with shading, wants position. A. Blehr, 53 Butler St., B'klyn, N. Y.

Wanted—Position by young graduate with some exp. as draftsman; small salary. H. C., AM. MACH.

Mech. draftsman with except'l references desires pos. in N. Y. City. Practical, AMERICAN MACHINIST.

Wanted—Draftsman and machinist with technical training desires a change. Draftsman, AM. MACH.

Wanted—Tool makers, punch and die makers. Address the Superintendent of the Schneider & Trenkamp Co., Cleveland, Ohio.

Pattern maker wanted, to take charge of metal pattern room. Illinois Malleable Iron Co., No. 581 Diversey Avenue, Chicago, Ill.

Wanted—Foremanship of foundry; well recommended; light or heavy castings; 18 yrs. foreman on chilled car wheels. Foreman, Box 65, AM. MACH.

Wanted at Once—2 or 3 thor. comp't locomotive draftsmen. State age, exp., salary required, with refs. Brooks Locomotive Works, Dunkirk, N. Y.

Wanted—Foreman, good mach., for Western factory. One understand'g foundry work preferred. C. H., AMERICAN MACHINIST.

Wanted—Foreman pattern maker, familiar with pump work. Address, giving age, experience, and wages expected. Box 71, AMERICAN MACHINIST.

Wanted—Position as sup't or foreman; successful in the systematic mfg. of machine tools, automatic & interchg'ble mach'y. H., Box 310, Florence, Mass.

A first-class practical draftsman, 8 years' shop practice, experienced in special machinery, wants to change position. Box 73, AM. MACHINIST.

Good floor and machine hands, also good pattern makers wanted. Apply Bement, Miles & Co., Twenty-first and Callowhill Sts., Philadelphia, Pa.

A machinist foreman, in charge of men 10 years, wants better position January 1st; experienced in many branches. "W.," AM. MACHINIST.

Wanted—Draftsmen in a m't'g establishment making mach'y & tools; state age, qualifications, exp., & expectations. P. O. Box 29, Providence, R. I.

An industrious young man, a first-class machinist, desires a position as assistant draftsman; has worked 2 years in drawing room. Box 74, AM. MACH.

Wanted—One exp'd tool maker on 1st-class punch and die and general tool work; also one good tool dresser and temperer of punches, dies, reamers, etc. Address Baltimore, Md., care AM. MACHINIST.

A young man of 20 wants to work under instructions in a good job machine shop; am willing to work a month if given a good chance to learn. C. B., AMERICAN MACHINIST.

Draftsman and designer is open for engagement Jan. 1. Have had practical exp. in shop, and the design of shop tools, etc. Can supt'd erection and handle men. Mechanical Engineer, AM. MACH.

Foundry foreman wanted for shop running fifty molders on light bench and floor work; also man for malleable foundry. Illinois Malleable Iron Works, No. 581 Diversey Avenue, Chicago, Ill.

Wanted—Young man as draftsman in machine shop in New Hampshire, building special machinery; salary moderate at start; good opp'y for advancem't; grad. mech'l school pref'd Box 67, AM. MACH.

Wanted—Position as foreman, by an American, age, 33; 7 years' exp. in two shops; first-class machinist; best reference from past and present employers. Address Box 72, AMERICAN MACHINIST.

Wanted—A 1st-class mach'y salesman, familiar with modern single-valve automatic engines, and gen. power requirem'ts for electric light & railway service. State exp., salary exp'd. Box 63, AM. MACH.

Wanted—An active, ambitious young machinist who is ready to go onto a printing press erecting floor and learn the business with a view to taking charge of the work. Address, giving age and references, New York, care AMERICAN MACHINIST.

Mechanical engineer, specialty machine tools, speaking English, French and German, with numerous personal acquaintances amongst European firms, would take engagement as representative of good factory at Chicago Fair. H., AM. MACHINIST

Bradley Hammers.

If you plate, draw, square, taper, swage, collar, spindle, or do any manner of die forging in iron or steel, a BRADLEY HAMMER will soon pay for itself, by what it will save over any other similar tool. Send for circulars.

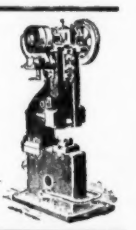
BRADLEY & COMPANY, SYRACUSE, N. Y.

HACKNEY HAMMERS

Meet all requirements more fully and satisfactorily than any other of its competitors.

INVESTIGATION IS NOT COSTLY.
INVESTIGATION IS CONVINCING.

WRITE FOR CATALOGUE TO
THE HACKNEY HAMMER CO.,
20 Johnson St., CLEVELAND, O.



GRANT'S NEW GEAR SHOP
IN PHILADELPHIA.

I have at 125 South Eleventh St., in the business center of Philadelphia, a new gear shop fully equipped for making or cutting gears, and fully stocked with iron and brass ready-made gear wheels.

GEO. B GRANT, Lexington, Mass., and Philadelphia, Pa.

STEAM ENGINE CATECHISM.
Complete in one Volume.
By ROBT. GRIMSHAW, M. E.
Price, $2.00, Postpaid.
JOHN WILEY & SONS,
NEW YORK.

MACHINISTS, Write for Circular of

COMBINATION INSIDE MICROMETER CALIPER AND DEPTH GAUGE.
Agents wanted. J. T. SLOCOMB & CO., PROV., R. I.

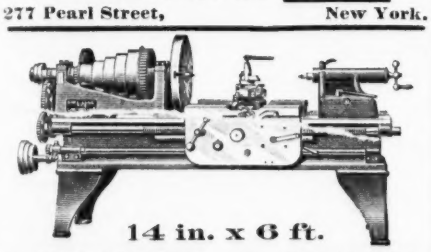
The Engineering RECORD

Founded fourteen years ago and prior to 1887 known as *The Sanitary Engineer*. The recognized authority on Municipal and Building Engineering. Recently enlarged by the addition of a department conducted, as is its custom, under the advice of an expert, in which notable industrial plants are regularly described and illustrated, the steam and power plants being a conspicuous feature.

Published every Saturday, $5 per year to United States, Canada and Mexico—$4 to other countries. Sample copies and list of its publications free. Address,

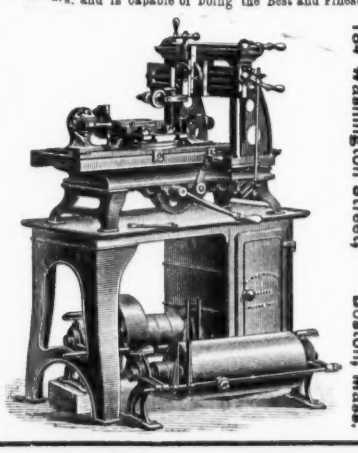
THE ENGINEERING RECORD,
277 Pearl Street, New York.

VANDERBEEK'S
MILLING MACHINE.
FIVE STYLES.
DOES STRAIGHT, CIRCULAR AND IRREGULAR WORK.
THE STATES MACHINE CO.,
HARTFORD, CONN.



14 in. x 6 ft.
ENGINE LATHE.
22 in. x 8 ft., 10 ft., 12 ft., 14 ft. x 16 ft.
LATEST IMPROVED
ENGINE LATHES.
ADDRESS
DIETZ, GANG & CO.
58 & 60 PENN ST.,
CINCINNATI, O., U. S. A.

POWER OR HAND PLANER,
FOR MODEL MAKERS, EXPERIMENTAL WORK, &c.
Has all the Improved Features Usually Found on High Grade Planers, and is Capable of Doing the Best and Finest Work.



MANUFACTURED BY
A. J. WILKINSON & CO.,
184 Washington Street, Boston, Mass.

FOR SALE AT AUCTION,
On SATURDAY, January 21, 1893, at 10 o'clock A. M., on the premises,
FOR ACCOUNT OF WHOM IT MAY CONCERN,
THE ENTIRE EQUIPMENT OF THE
BOSTON HEATING CO.,
464 ATLANTIC AVENUE, BOSTON, MASS.

Consisting of Tubular and Sectional Boilers, about 4000 H. P.; Engines 1 to 40 H. P. each; large number of Steam Pumps, Blake's and Knowles'; Sturtevant Fan Blowers, large and extra sizes, with engines, Westinghouse Dynamo, 20 Arc light, Tanks of various sizes, Lathes and Drills, large quantity of piping and valves, wrought and cast-iron, Wrought-iron smoke stacks. All shafting and pulleys, steam piping, valves and connections, in position as used by the company, all in good condition. Also, in storehouse, a very large stock of steam fitters' and machinists' tools and supplies, mostly new. 50,000 to 75,000 Dover pressed hard brick and fire brick. Ten tons Asbestos sectional and loose covering, etc., etc.

FOR PARTICULARS APPLY TO
HUBBARD BREED, 43 State St.,
E. ROLLINS MORSE & BRO., 38 State St., or to } BOSTON, MASS.
H. HARRIS & CO., Auctioneers, 227 State St.,

Valuable Manufacturing Property
AT AUCTION,
On Wednesday, January 11, 1893.

At 12 o'clock M., at the office of George H Burnham, No. 1 Custom House Street, Providence, R. I.

The Richmond Paper Co. Estate,

Consisting of about 28 acres of land in East Providence, R. I., three miles from the city of Providence, upon the Seekonk River and upon the Providence & Worcester Railroad, affording excellent water and railroad communication.

The **Buildings** are mainly of brick and of the following dimensions:

One building, 160x65, four stories.
One building, 200x50, one story with attic.
Two buildings, 150x60, one story.
One building, 200x30, one story.
One building, 200x40, one story.
One building, 130x60, one story.

The one-story buildings are constructed with walls suitable for an additional story.

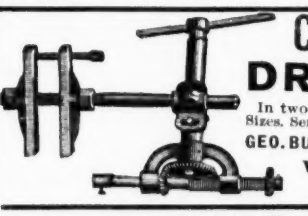
Also engine house, boiler house, water filter beds and a large boarding house and several tenements.

The **Steam Plant** consists of two Greene improved engines of 600 H. P. each, and 14 six-feet horizontal tubular boilers in good order.

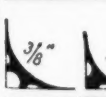
The **Water Supply** is abundant and of the purest quality.

Terms of sale, five per cent. of the purchase money in cash at the time of sale and the remainder upon the delivery of the deed at the Banking House of the Rhode Island Hospital Trust Company, in the city of Providence, on the 25th day of January, 1893.

THE RHODE ISLAND HOSPITAL TRUST COMPANY, Trustee.

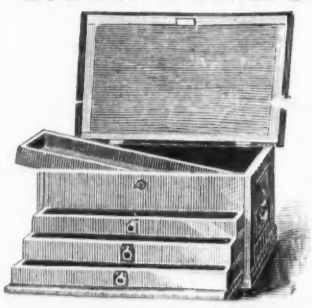


CLAMP DRILLS
In two Styles and four Sizes. Send for circular to
GEO. BURNHAM & CO.,
Worcester, MASS.



Flexible Metallic Fillet
3/16" 5/16" 1/4"
For Pattern Makers. 8 Sizes.
H. WHITE, 44 N. 4th St. Phila, Pa.

A CHRISTMAS PRESENT
Of a Set of FINE TOOLS



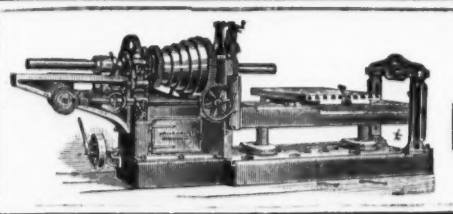
Would be appreciated by anyone, and would afford enjoyment to the recipient.

LISTS ON APPLICATION.
FRASSE & CO.
90-94 PARK ROW, - NEW YORK CITY.

WE TALK QUALITY

first. Then when we have convinced the customer that we have the best, we name as low a price as will leave us a fair profit. We do not cater to the trade which prefers an inferior article because it is cheap. Such goods only have to be replaced later by well-made ones.

MASON REGULATOR CO.,
BOSTON,
Manufacturers of Valves.



BETTS MACHINE CO.,
WILMINGTON, DEL.
MACHINE TOOL BUILDERS.
IMPROVED PATTERNS! LATE DESIGNS!

H. W. JOHNS'
ASBESTOS

ASBESTOS SECTIONAL PIPE COVERINGS.

Non-Conducting Coverings for Steam and Hot Water Pipes, Boilers, etc.
ASBESTOS BOILER COVERINGS.
H. W. JOHNS MANUFACTURING COMPANY,
H. W. Johns' Asbestos Millboard, Sheathings, Building Felts, Fire-Proof Paints, Liquid Paints, Asbestos Roofing, Etc.
87 MAIDEN LANE, N. Y. JERSEY CITY, CHICAGO, PHILADELPHIA, BOSTON, ATLANTA, LONDON.

Wanted—By a young machinist and tool maker of ability, a position to take charge; familiar with modern methods of manufacture; good experience and good references. Address Box 64, AM MACH.

Small, but well-established machine business has grown to need supt. with small capital; energetic man willing to grow up with business, and not afraid of work, address as below; those looking for soft thing don't write. Box 70, AM. MACHINIST.

✣ MISCELLANEOUS WANTS ✣

Advertisements will be inserted under this head at 25 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d-hd lathes & planers. S.M.York,Clev'd,O.

Auto. Steam Flue Cleaners. Kelley Co., Erie, Pa.

For Sale—Second-hand drill presses, engine lathes and planers. Dietz, Gang & Co., Cincinnati, O.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Engines, special and gen. mach'y designed; ideas developed. A. W. Jacobi, 136 Liberty St., N. Y.

Best Bolt Header in the world for $50. Address C. H. Baush & Sons, Holyoke, Mass.

Wanted—One second-hand freight elevator, one to two tons capacity. Box 69, AM. MACHINIST.

Combined engine and boiler, 4-horse, $150; cost $350; tested 150 pounds. 229, AMERICAN MACHINIST.

Screw cutting lathes 23", 25", 30" swing; good massive tools; $210, $375, $340. 229, AM. MACHINIST.

Screw cutting lathes, 17" and 20" swing, with chucks, $105 and $165; great bargains. 229, AM. MACH.

Wanted—Hardware specialties to build. Send 25 cents for "Eureka Knife and Shears Sharpener." W. A. Smith & Co., 227 Eddy Street, Providence, R.I.

For Sale—Machine shop and supply store, doing an increasing business in a growing city in Florida. Address Box 49, AMERICAN MACHINIST.

Special, experimental or other light machinery manufactured. Best equipped shop in the West for fine work. Manufacture one of the best hollow spindle bench lathes for the tool room or for manufacturing. Write us. Moseley & Co., Elgin, Ill.

MACHINE TOOLS

IN STOCK.

LATHES.

All sizes of FLATHER.
" " BLAISDELL.
" " FIFIELD.
One each, 14"x6' and 24"x12' FITCHBURG.
One 78"x15' SELLERS.

PLANERS.

All sizes of WHITCOMB.
" " FLATHER.
One each, 30"x8' and 36"x8' PEASE.

DRILLS.

All sizes of PRENTICE.
" " BLAISDELL.
One 5' CINCINNATI RADIAL.
One 8" NEWTON SLOTTER.
All sizes of HENDEY and EBERHARDT SHAPERS.

WRITE FOR PRICES.

HILL, CLARKE & CO.,

156 OLIVER ST., BOSTON, MASS.
CHICAGO BRANCH, 12 and 14 South Canal Street.

SECOND-HAND AND NEW MACHINERY.

ON HAND.

62 in.x61 in.x9 ft.		2 Heads, Bement.
72 in.x48x33 ft.		3 Heads.
62 in.x48 in.x17 ft.	do	1 do
54 in.x42 in.x24½ ft.	do	2 do
48 in.x42 in.x16 ft.	do	1 do
39 in.x36 in.x12 ft.	do	1 do
36 in.x38 in.x8 ft.	do	Powell Al.
30 in.x30 in.x7 & 8 ft.	do	1 Head.
26 in.x26 in.x6 ft.	do	1 do
25 in.x24 in.x6 ft.	do	1 do
22 in.x21 in.x6 ft.	do	1 do

90 in. x30 ft. Triple Gear Engine Lathe, Ames A1.
50 in.x30 ft. Bed, Triple Geared. New Engine Lathe.
30 in.x28 ft. D. W. Pond Shafting Lathe.

32 in.x12, 14, 16, 18 ft. Bed.		New	Engine	do
28 in.x12, 14, 16, 18 ft.	do		do	do
21 in.x10, 12 ft.	do		do	do
20 in.x 7½ & 8 ft.	do	2d Hand	do	do
18 in.x 6, 7 & 8 ft.	do	New &	do	do
17 in.x 8 ft.	do		do	do
16 in.x 6 & 8 ft.	do	do	do	do
15 in.x 6 & 8 ft.	do	do	do	do
14 in.x 6 ft.	do	do	do	do

Car Axle Lathe, Bement.
9 & 12 in. Stroke Slotters.
15, 16, 18, 25 in. Crank Shapers.
20, 24, 26 & 30 in. Geared Shapers.
20, 22, 24, 28, 30 & 36 in. Drills.
Bolt Cutters.
Brown & Sharpe Universal Miller.
Lot of Lincoln Pattern Millers.
No. 2 Screw Machine. Garvin.
2, 3 and 4 Spindle Drills. Garvin
No. 20 and 75 Bliss Presses.
1 8k. Geared Miller. U. V. Co. Good.
1 Brainerd No. 3 Miller, A1.
1100 and 3000 lb. [illegible] Steam Hammer.
100 and 150 lb. [illegible]n Hammer.
42 in. Sellers Hyd. Wheel Press.

GEO. PLACE MACHINE CO.,
120 BROADWAY, NEW YORK.

DESIRABLE SECOND-HAND MACHINERY

LATHES.

1 17 in. x 6 ft. Blaisdell, Rise and Fall Rest, 15-in. 3-Jawed Combination Chuck, fitted. A1 condition
1 16 in. x 6 ft. Prentice, Rise and Fall Rest, 10-in. 4-Jawed Combination Chuck, fitted. Good as new
1 15 in. x 8 ft. Fitchburg, Rise and Fall Rest, 9-in. 3-Jawed Combination Chuck, fitted. A1 condition

PLANERS.

1 30 in. x 30 in. x 8 ft. Hewes & Phillips, one Head, Spiral Geared, Fine heavy Tool. Good as new
1 20 in. x 16 in. x 5 ft. Lincoln, with Index Centers. Good order
1 18 in. x 22 in. Blaisdell Crank Planer. A1 condition
1 15 in. x 15 in. x 3 ft. Planer. A1 condition

MISCELLANEOUS.

1 22 in. Gould & Eberhardt Auto. Gear Cutter, Spur and Bevel. Good as new
1 16 in. Wright Geared Shaper. A1 condition
1 8 in. Boynton & Plummer Shaper, with Vise. A1 condition
1 No. 3 Garvin 6-Spindle Drill Press, with Chucks, fitted. Good as new
1 20 in. Drill Press, Reed, Wheel and Lever, No. 2 Little Giant Chuck, fitted. A1 condition
1 24 in Drill Press, Sliding Head, Back Gears, Wheel and Lever Feed. Good as new
1 25 in. Barnes Drill Press, Back Geared, Power Feed. A1 condition
1 Single-Spindle Garvin Profiling Machine. A1 condition
1 Brown & Sharpe Surface Grinder. Good order
1 No. 4 Garvin Milling Machine, with Arm, Vise and Arbors. A1 condition
1 No. 2 Garvin Power Miller, with Vise. Good as new
1 Merritt Heavy Back Geared, Miller, with Arm, Table 36 in. long, 12 in. wide, 3 "T" Slots. Good order
1 No. 21 Bliss Adjustable Power Press. Good as new
1 No. 2 Brown & Sharpe Screw Machine, Wire Feed. A1 condition
1 each No. 1 and No. 2 Garvin Screw Machines, with Wire Feed. A1 condition
400 other new and second-hand tools in stock. Write for list and prices.

THE GARVIN MACHINE COMPANY,
LAIGHT AND CANAL STS. NEW YORK.

MACHINERY,

Improved NEW Tools.

Upright Boring and Turning Mill, 38 in. swing. "New features."
Hor. Boring and Drilling Machines, all sizes, for prompt delivery.
Universal Milling Machines. "New features."
Standard Milling Machines, all sizes, for light and heavy work. "New features."
Radial Drills, 3 to 8 ft. arms, "Stiffest" and most powerful Radials made.
Pulley Lathes, all sizes, for turning and boring at same time.
Engine Lathe, 13 in. x 6 ft. "New features." Hollow spin dle, 1 1-16 in. hole, Compound Rest, Cross feed and Taper att.
Engine Lathe, 22 in. x 10-12 ft. New heavy pattern. "New features."
Planers, 24 in. x 6 ft., 30 in. x 8 ft., 36 in. x 12 ft. "Improved styles."
Shapers, 15 and 24 in. "New features."
Boiler Bending Rolls, 8 and 10 ft., with Hinged Housings and several improvements.

Second-hand--Modern Style, A1 Order.

Brown & Sharpe Vertical Turret Chucking Machine.
Brown & Sharpe Screw Machines, complete, with Auto. Chuck.
Ames Engine Lathe, 20 in. x 10 ft., with Compound Rest, Cross Feed, Special reverse feature and Chuck.
Lathe and Morse Engine Lathe, 20 in. x 18 ft., with Compound Rest and Chuck.
Pond Planer, 26 in. x 6 ft. Complete.
Heavy Planer, 42 in. x 9 ft. Complete.
Shapers, 6, 8, 9, 12, 14, 15 and 24 in.
Slotting Machine, 8 in. Modern style. Auto. feeds. Complete.
Pratt & Whitney Profiler, 2 Spindle.
Bliss style, No. 20 Press. Complete.

J. J. McCABE,
SUCCESSOR TO
E. P. BULLARD'S N. Y. Mach'y Warerooms.
68 Cortlandt Street, NEW YORK.

NOTICE.

All owners or inventors of smoke-consuming device are hereby notified that if they have anything which will prevent the making of smoke in connection with the burning of soft coal or consume the smoke if made, will bring the same to our notice, their claims will be thoroughly investigated by the committee appointed at a meeting of Soft Coal Consumers of Boston.

All communications, accompanied by blue-prints or drawings, showing in a clear manner the device proposed, should be addressed to

F. A. GILBERT, Chairman,
No. 77 Ames Building,
BOSTON, MASS.

STARRETT'S

FINE TOOLS

Warranted Accurate—Best in Workmanship—Latest in design—Finest in Finish—Send for Catalogue.

L. S. STARRETT,
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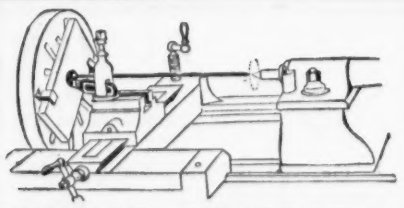

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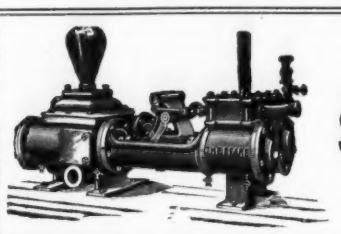

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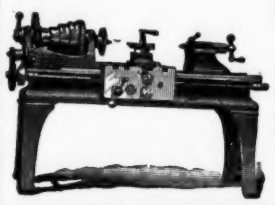

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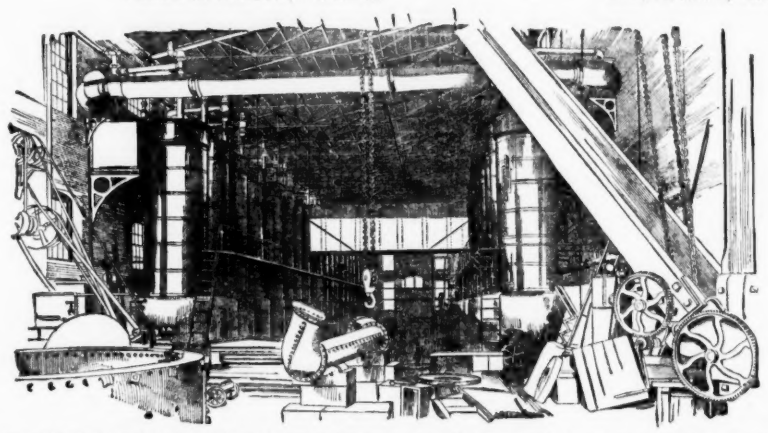

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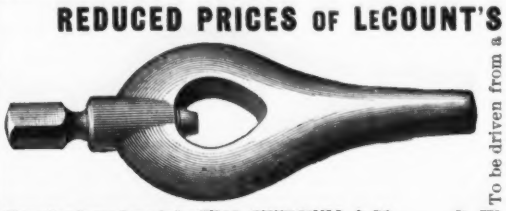

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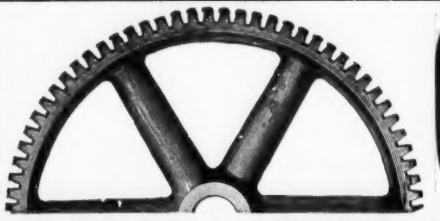

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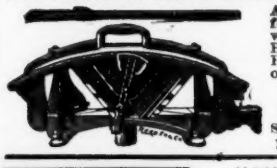

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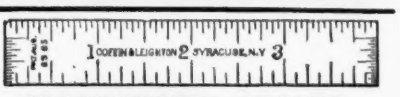

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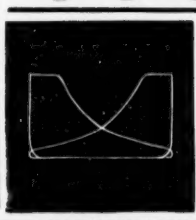

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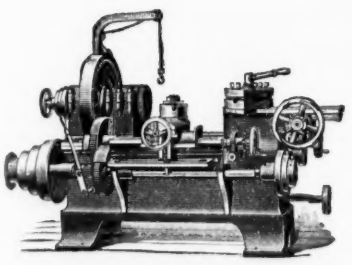

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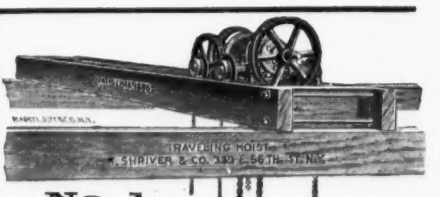

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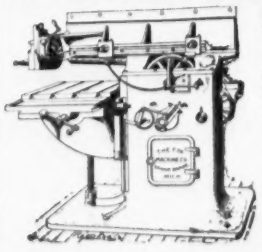

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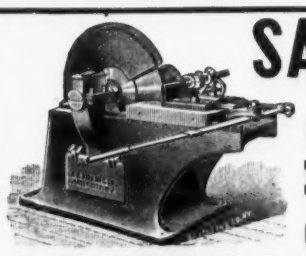

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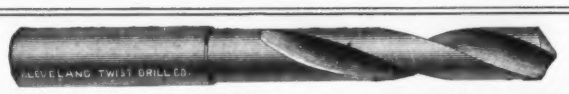

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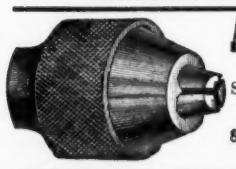
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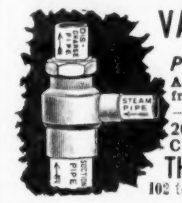
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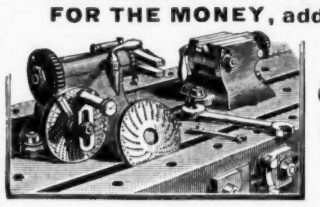
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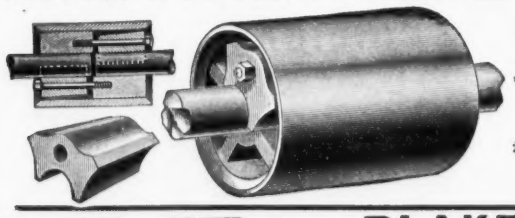
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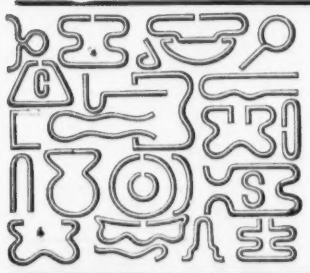
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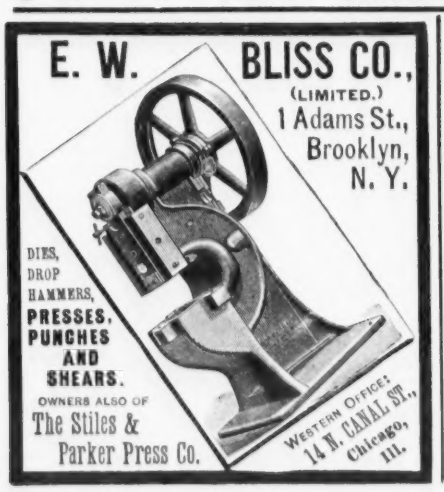
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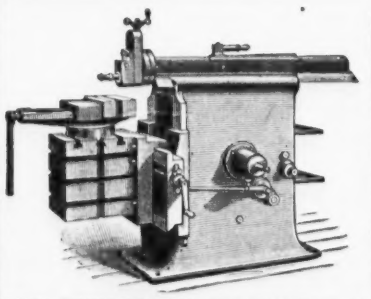
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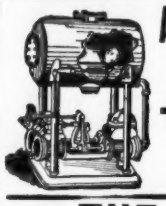
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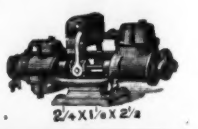
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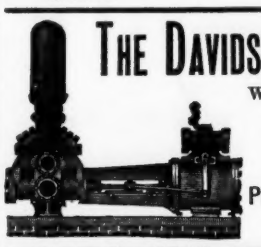
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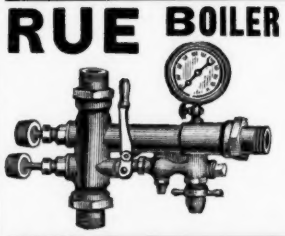
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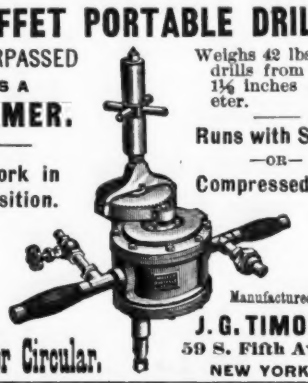

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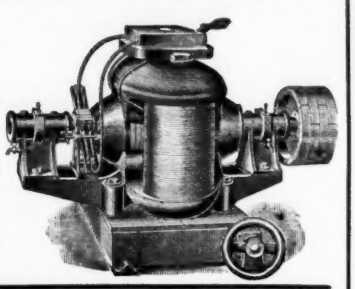

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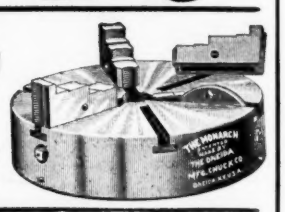

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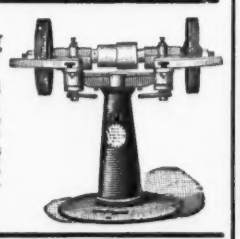

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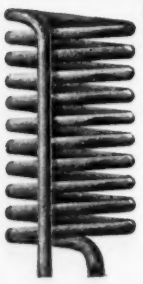

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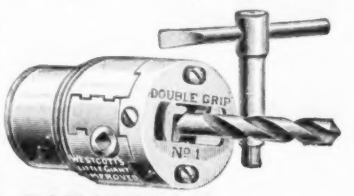

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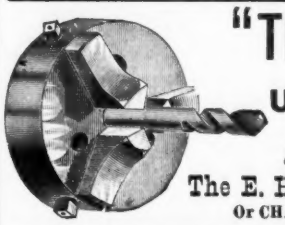

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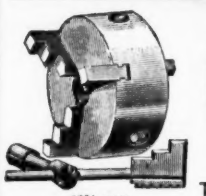

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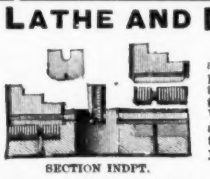

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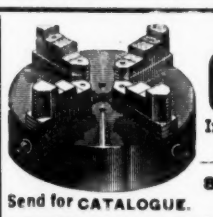

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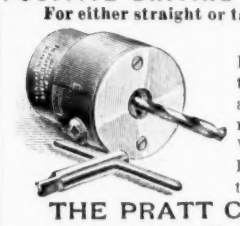

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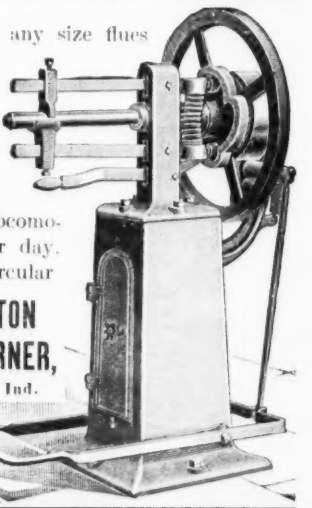

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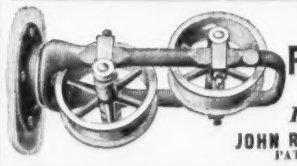

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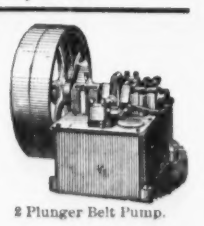

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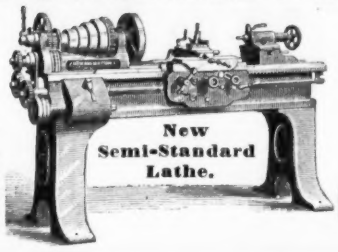

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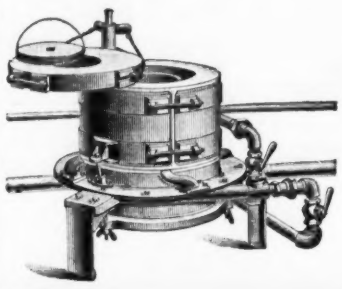

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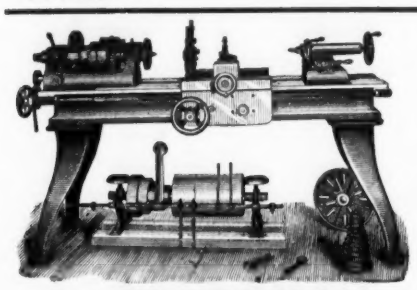

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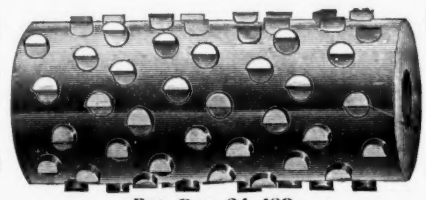

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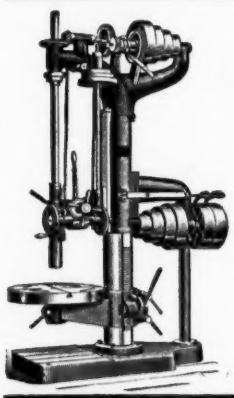

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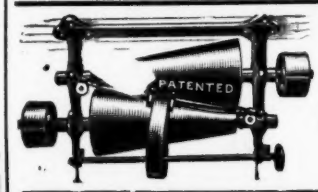

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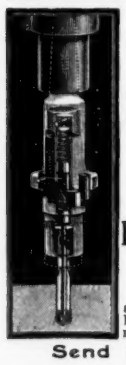

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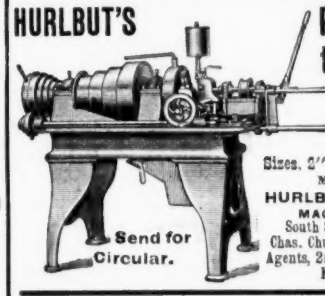

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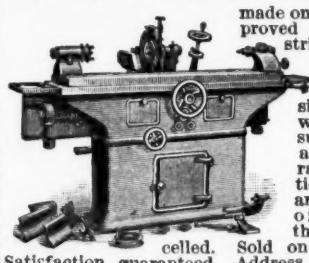

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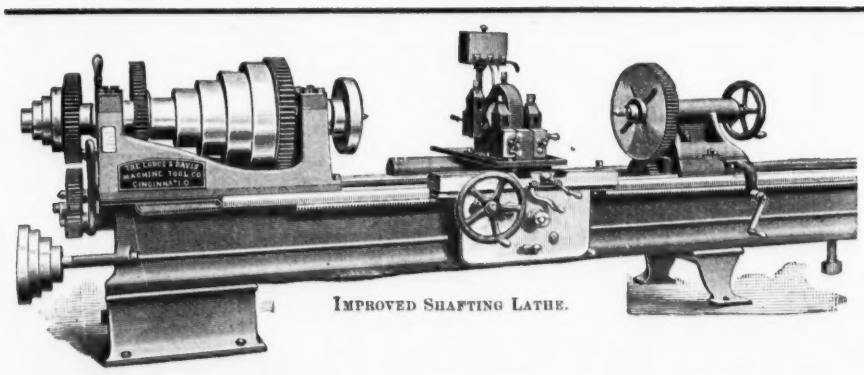

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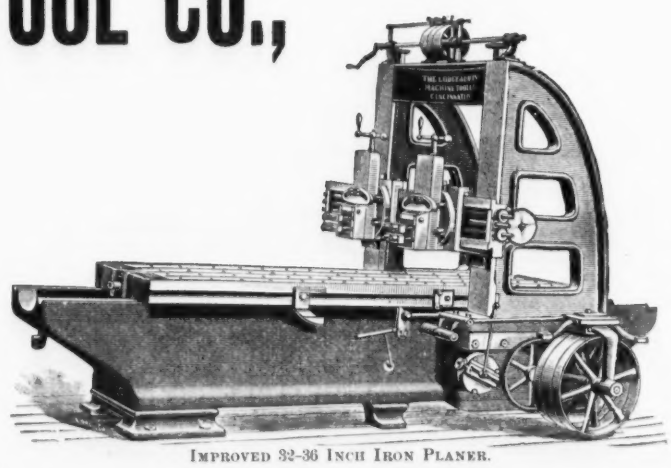

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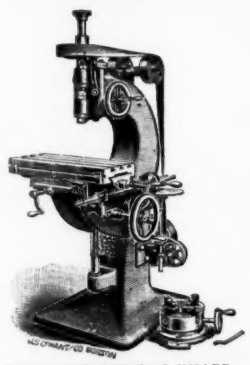

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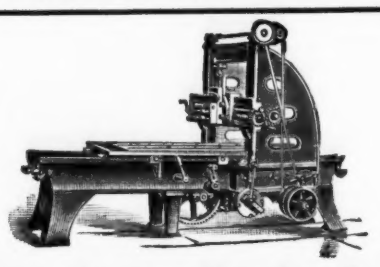

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Modern Design. New Features. High Class Workmanship
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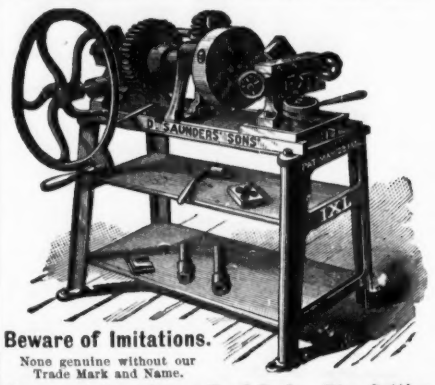

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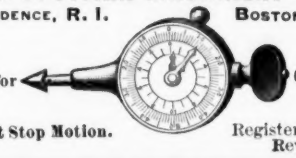

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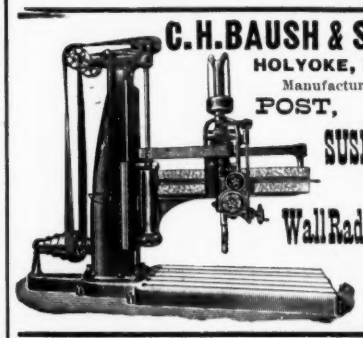

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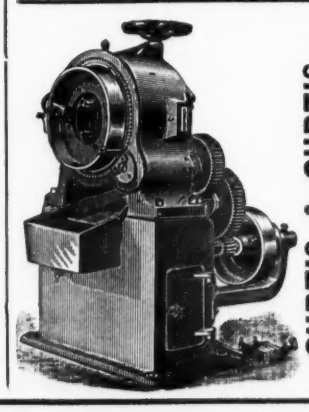

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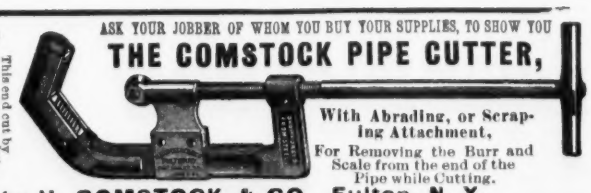

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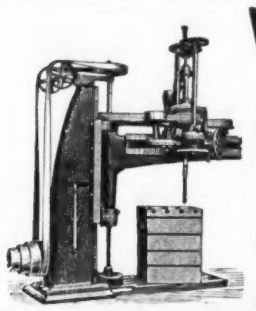

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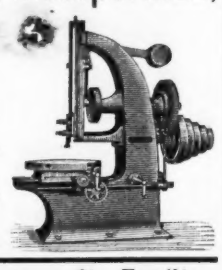

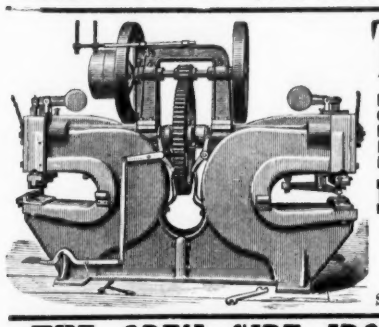

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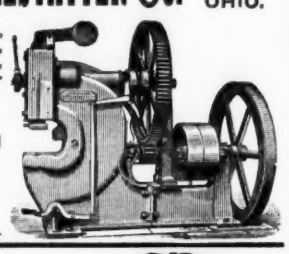

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THE DETRICK & HARVEY MACHINE CO., Baltimore, Md.

WM. KNABE & CO., Pianos.

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With best wishes, we remain,

Yours very truly,

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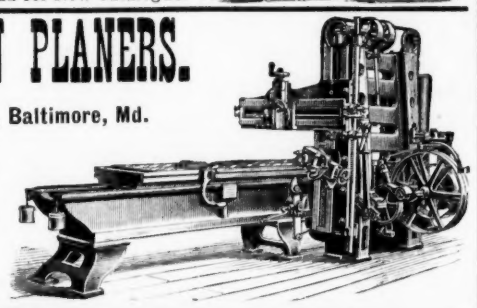

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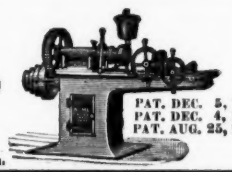
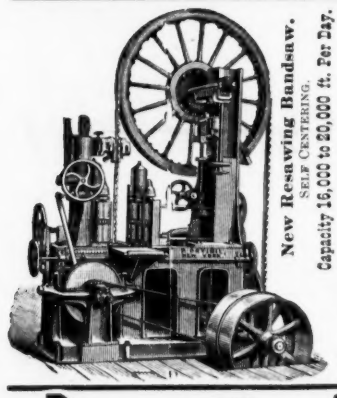


PAT. DEC. 5, 1882.
PAT. DEC. 4, 1883.
PAT. AUG. 25, 1885.



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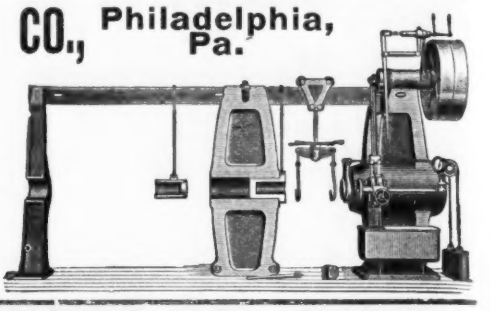

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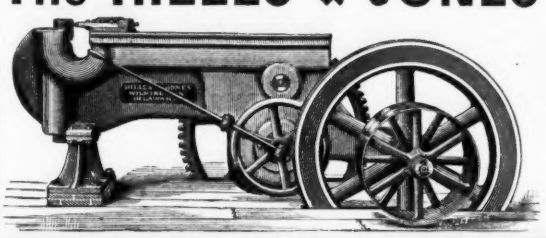

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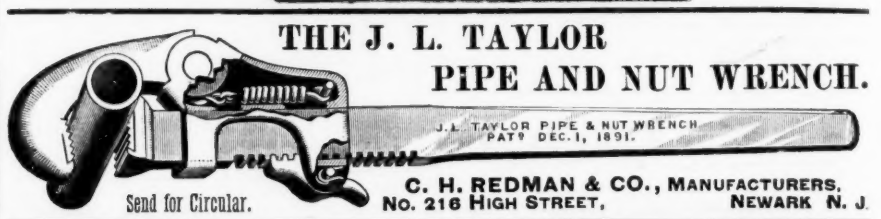

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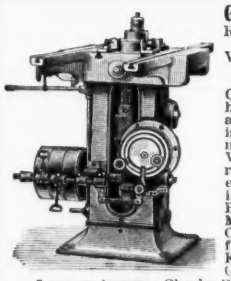

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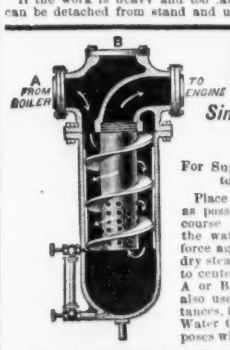

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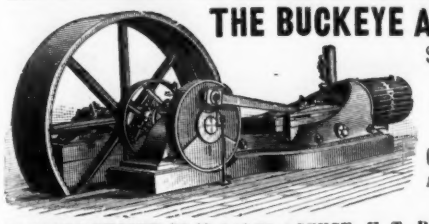

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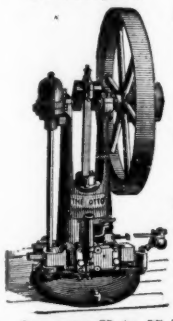

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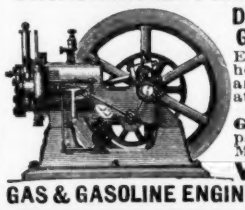

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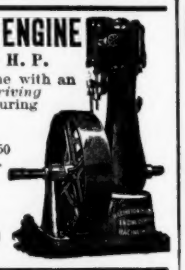

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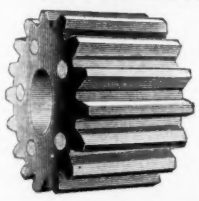

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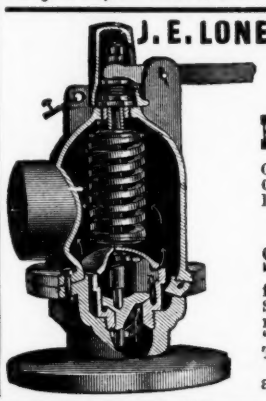

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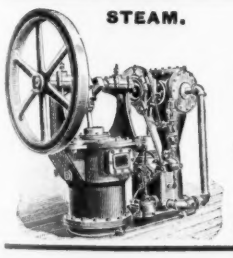

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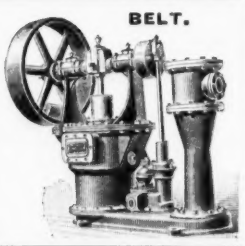

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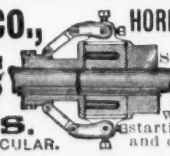

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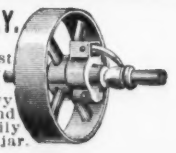

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WE WILL GUARANTEE TO do more accurate **BOLT THREADING** than any machine made. Changes from one size to another can be made in one minute. No complicated head to get out of order.

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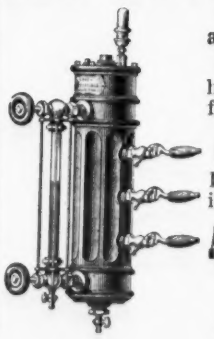

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It will prove a good investment.

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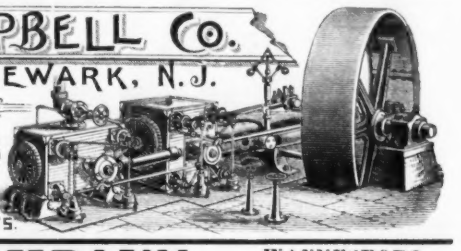

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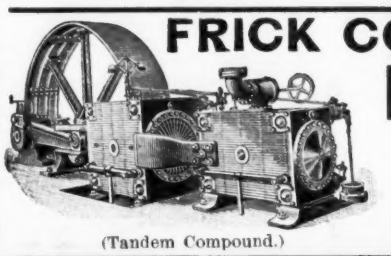

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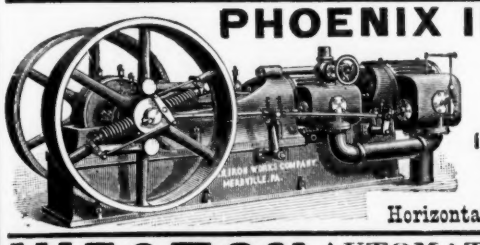

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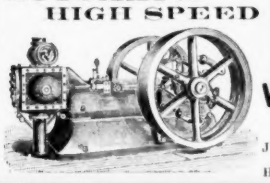

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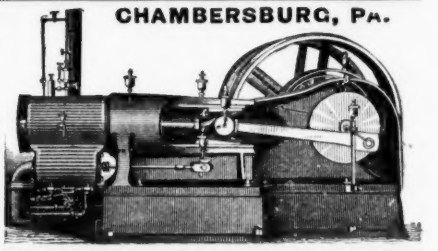

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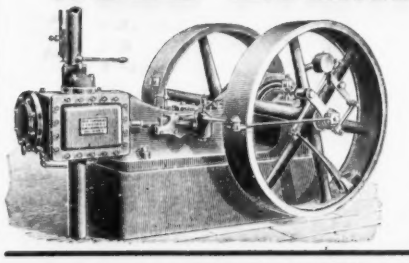

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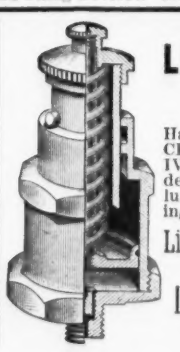

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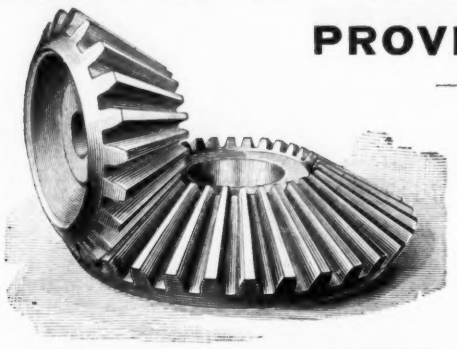

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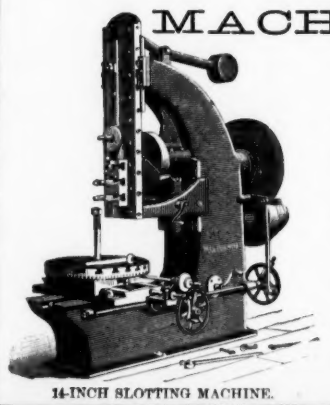

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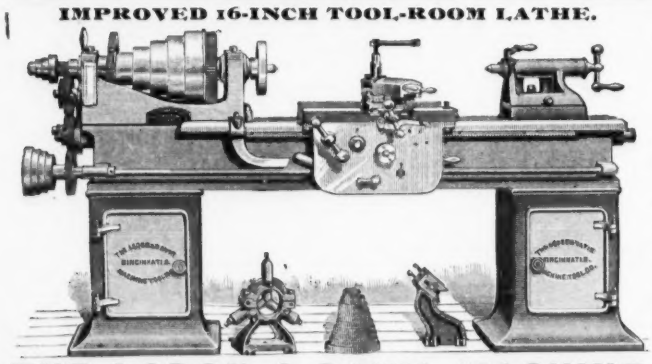

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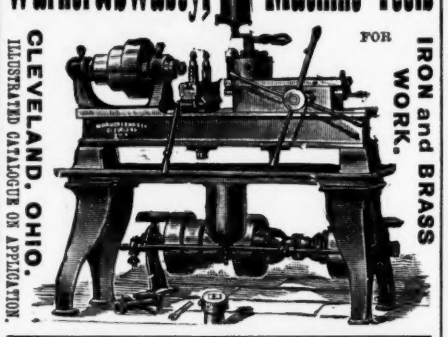

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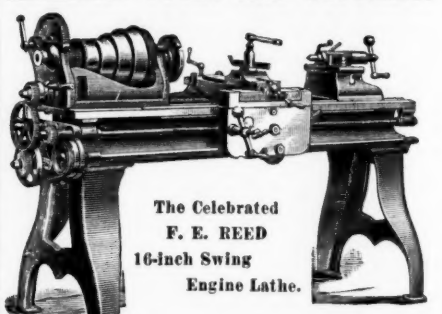

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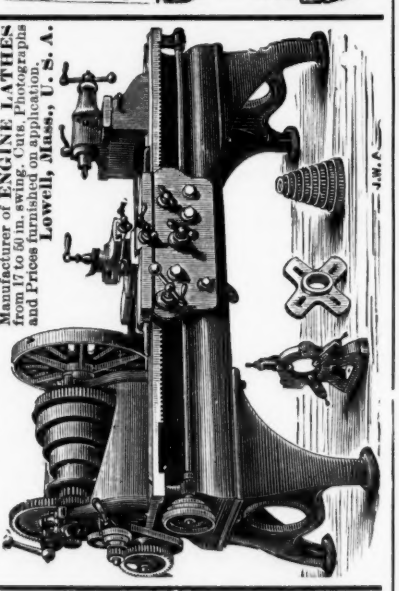

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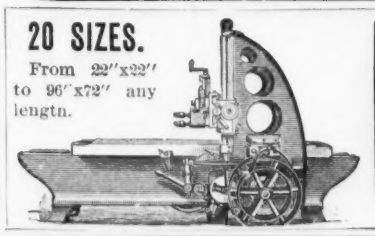

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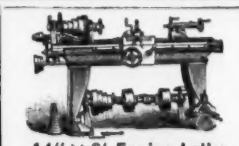

14" × 6' Engine Lathe.

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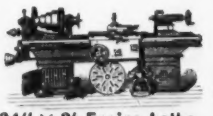

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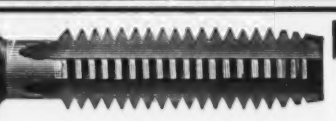

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